ROUTER-B CARD FOR AM3440
USER'S MANUAL

LOOP TELECOMMUNICATION INTERNATIONAL, INC.
8F, NO. 8, HSIN ANN RD.
SCIENCE-BASED INDUSTRIAL PARK
HSINCHU, TAIWAN
Tel: +886-3-578-7696
Fax: +886-3-578-7695

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D Bitte führen Sie das Gerät am Ende seinerLewbensdauer den zue Verfügung stehended Rückgabeund Sammelsystemen zu.

GB At the end of the product's useful life, please dispose of it at appropriate collection points provided in your country

F Une fois le produit en fin devie, veuillez le déposer dans un point de recyclage approprié.

ES Para preservar el medio ambiente, al final dela vida útil de su producto, depositelo en los laguares destinado aello de acuerdo con la legislación vigente.

P No final de vida útil do producto, por favor coloque no ponto de recolha apropriado.

I Onde tutelare l'ambiente, non buttate l'apparecchio trai i normali rifiuti al termine della sua vita utile, ma portatelo presso i punti do taccolta specifici per questi rifiuti previsti dalla normativa vigente.

NL Wij raden u aan het apparant aan het einde van zijn nuttige levensduur, niet bij hey gewone huisafval te deponeren, maar op de dearvoor bestemde adressen.

DK Når produktet er udtjent, bor det børtskaffes via de sæ rlige indsamlingssteder i landet.

N Ved slutten av produktets levetid bør det avhendes på en kommunal miljøstasjon eller leveres til en elektroforhandler.

S Lämna vänligen in produkten på lämplig återvinningsstation när den är förbrukad.

FIN Hävitä tuote käytöiän päättyessä viemällä se asianmukaiseen keräyspisteeseen.

PL Gdy produkt nie nadaje sie juz do dalszego uzytku, nalezy zostawic go w jednym ze specjalnych punktów zajmujacych sie zbiórka zuzytych producktów w wybranych miejscach na terenie kraju.

CZ Po skončení jeho životnosti odložte prosím výrobek na přislušném sběrném místé zřízeném dle předpisů ve vaší zemi.

SK Po skončení jeho životnosti odovzdajte prosím zariadenie na príslušnom zbernom mieste podía platných miestnych predpisov a noriem.

SLO Ko se izdelku izteče življenska doba, ga odnesite na ustrezno zbirno mesto oziroma ga odvrzite v skladu z veljavnimi predpisi.

GR Στο Τέλος της λειτουργικής Ζωής του προϊόντος παρακαλώ
Πετξτε το στα ειδικά σημεία που Παρέχονται οτη χωρα σας.

PRC 當產品使用壽命結束,請在你的國家所提供的適當地點做好回收處理

1 Product Description

1.1 Description

Loop Telecom's Router-B card is designed for the Loop-AM3440 series. It occupies one regular slot of the Loop-AM3440. When used within the Loop-AM3440, this card combines the function of a router and directs Ethernet traffic to/from multiple WAN channels. With this card, access from LAN to WAN is accomplished within one card, resulting in savings in cost and in space.

1.2 Application

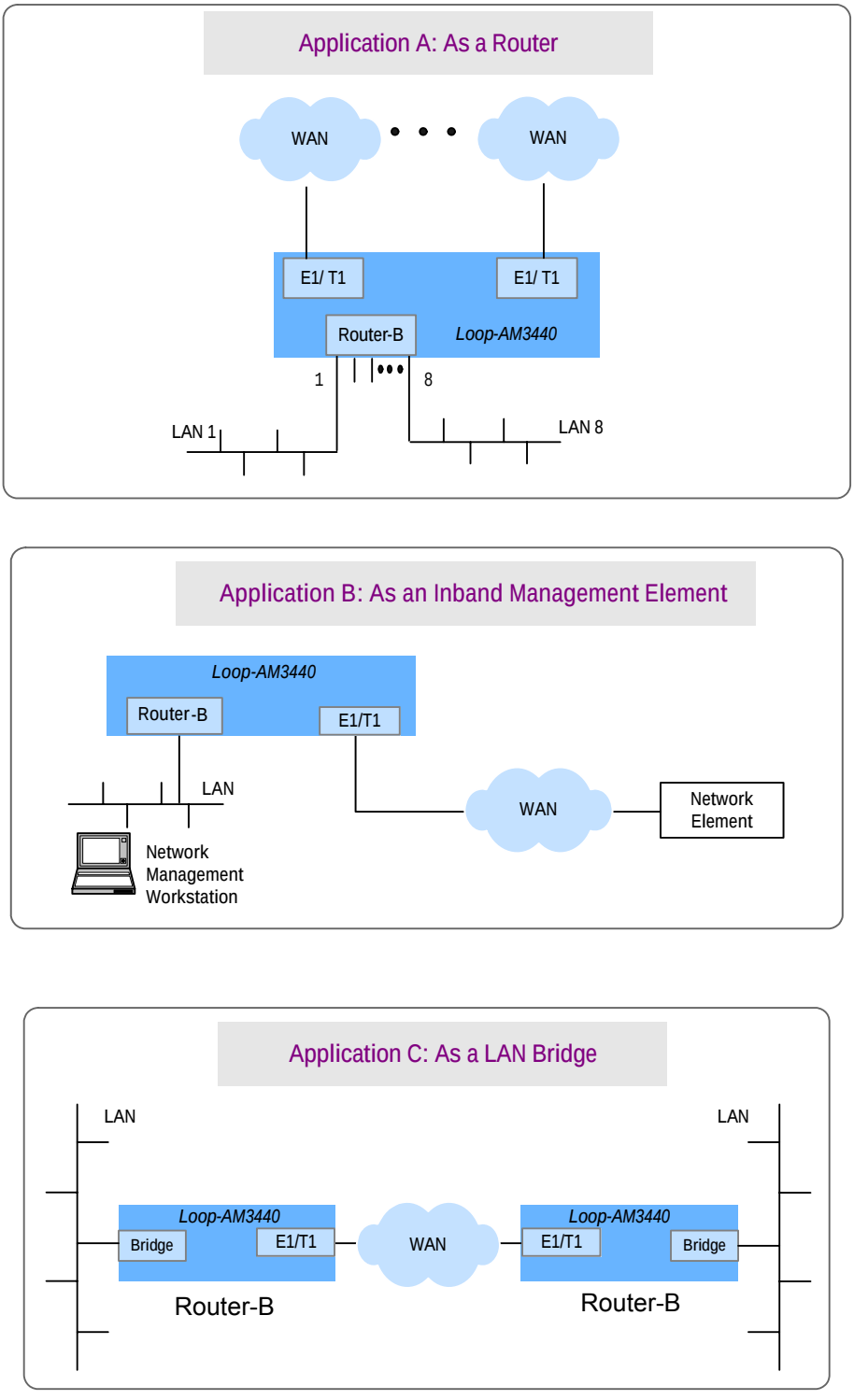


Figure 1- 1 Application Diagram

1.3 Specifications

WAN Interface

- Up to 64 WAN ports
- Each WAN port has data rate nX64K bps, $1 \leq n \leq 32$
- The total bandwidth of all 64 WAN ports is up to 8Mbps
- Layer-two protocol: HDLC, PPP/MLPPP, Frame Relay, Cisco compatible HDLC
- Up to 64 Frame Relay PVCs
- Each interface can be configured as a bridge port or router port

LAN Interface

- Eight 10/100BaseT interfaces
- Auto MDI/MDI-X crossover
- Speed auto-sensing
- Half/full duplex auto-negotiation
- Speed/duplex force mode
- Compliant to IEEE 802.3u
- One RJ45 connector per Ethernet port
- Each interface can be configured as a bridge port or router port

Router

- Routing protocol: RIP-I, RIP-II, OSPF
- Static route

Address Translation

- NAT/NAPT
- Static address table for NAT
- Port forwarding table for NAPT (Virtual Service)

DHCP

- DHCP server support for LAN users (RFC2131, RFC2132)
- BOOTP compatible
- DHCP relay

Access Control and Firewall

- Policy based on
  - Inbound/outbound direction
  - Source/destination IP addresses
  - Protocol types (ICMP, TCP, UDP, …)
  - Port number range
- Up to 64 control lists

QoS

- QoS based on rate limit
- Classification based on
  - Inbound/outbound direction
  - Source/destination IP addresses
  - DSCP
  - Protocol types (ICMP, TCP, UDP, …)
  - Port number range

Remote Bridge

- User configurable aging time
- Up to 16K MAC table
- Cisco ISL packet transparent
- VLAN packet transparent
- Padding/un-padding Ethernet FCS
- Rapid Spanning Tree Protocol support (IEEE 802.1w)
- VLAN-ID mapping
- MAC address based policy
- DHCP relay and server
- Routing between bridge group and router interfaces

Diagnostics

- Ping
- Traceroute

Physical

- 12 regular slots on AM3440-CHA and 3 regular slots on AM3440-CHB

2 Installation

2.1 Site Selection

The following list indicates a site selection guideline. Users need to follow this guideline to select a proper installation site.

- Location of the Rack should be part of the central office equipment layout design. Considerations should be given to entrance cable routing and -48 Vdc power.
- The installation site should have -48 Vdc power. An optional AC/DC power converter can be used. Use Only with Class 2 power source, -48 Vdc, 100 watts.

2.2 Mechanical Installation

The Router-B card is designed to be plugged into any of the available slots from 1 to 12 in the Loop-AM3440 devices. The front panel is shown in the following figure.

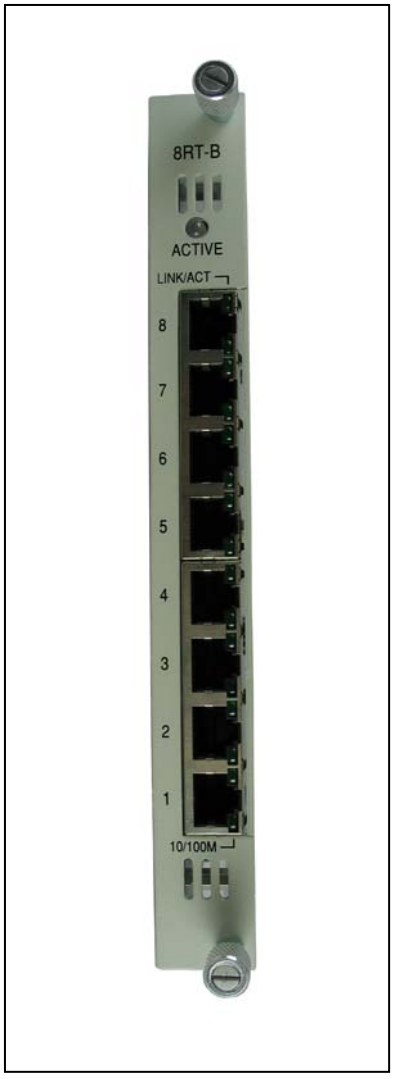


Figure 2- 1 Router-B Card Front Panel

2.3 Ethernet Connection

RJ45 10/100M Ethernet connection pin assignents are listed in Table 2-1 below.

Table 2- 1 RJ45 10/100M Ethernet Connector Pin Assignment

Pin Number	Signal
1	Transmit Data +
2	Transmit Data -
3	Receive Data +
4	No Connection
5	No Connection
6	Receive Data -
7	No Connection
8	No Connection

Note: The Ethernet interface supports Auto MDI/MDI-X and will work with either a parallel or a crossover cable.

3 Operation

This chapter describes the Router-B card configuration options and operational functions. Refer to subsequent chapters for detailed instructions regarding specific applications.

3.1 Using A Terminal

To use the RS232 interface to configure the unit, use a straight cable to connect a VT100 terminal to the DB-9 jack (Console Port) on the front panel of the AM3440 controller. The VT100 terminal can be a PC running VT100 emulator software. The unit is configured as a DCE.

3.1.1 VT-100 Monitor Connection

In order to properly set up the set up the Router-B plug-in card you will need a VT-100 Monitor. A VT-100 Monitor is a PC running emulator software. Use a DB-9 cable to connect the front Console Port of the AM3440 to either COM Port 1or COM Port 2 of the PC you are using as a VT-100 monitor. It doesn't matter which COM Port you connect to.

Note: Many newer PCs come with USB Ports. If user's PC has a USB port rather than COM ports you will need to purchase a available PC USB to DB-9 conversion cable commercially. These cables come with software which loaded in a PC, allow the user to send keyboard commands through the PC's USB Port to the DB-9 Console Port of the Router-B card.

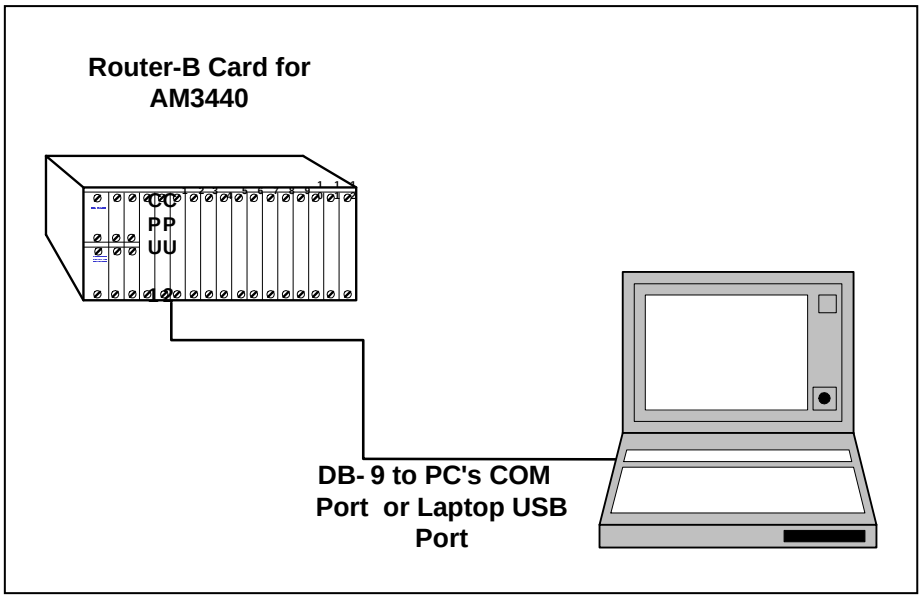
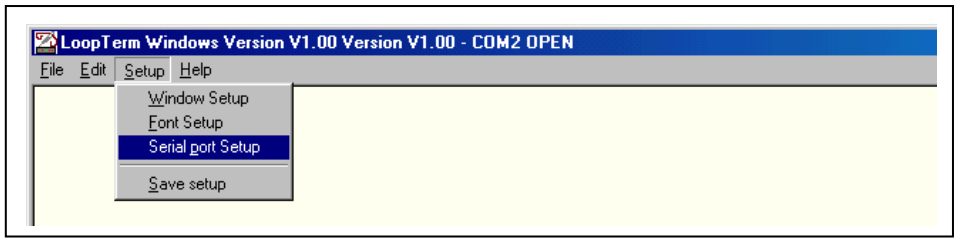


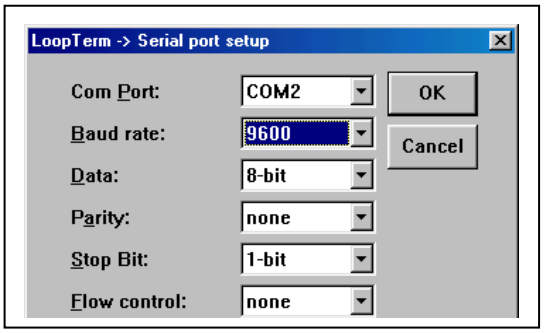
Figure 3- 1 VT-100 Monitor Connection

3.1.2 VT-100 Monitor Serial Port Setup

Open your VT-100 emulator program. Left-click your mouse on Setup. A drop-down menu will appear. Left click your mouse on Serial port Setup.



A Serial port setup screen will appear as shown below.

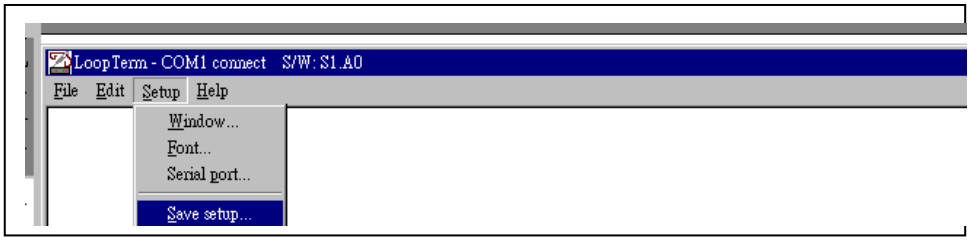


Set COM Port to whichever COM Port you are connected to on your VT-100 monitor. Then select your other settings from Table 3-1 below.

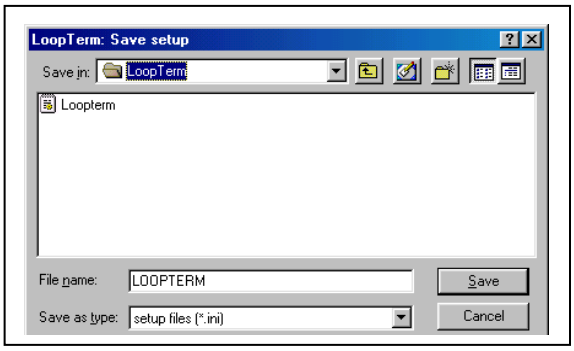
Table 3- 1 VT-100 Monitor Parameters Default Setting

Item	Options	Default
Baud	38400, 19200, 9600, 2400, 1200	9600
Data Bit	8, 7 bit per byte	8
Stop Bit	2, 1 bit	1
Parity Bit	NONE, EVEN, ODD	NONE

After selecting your settings left-click your mouse on OK. The setup screen will disapear.
To save your setup, left-click Save setup with your mouse, as shown in the screen bleow.

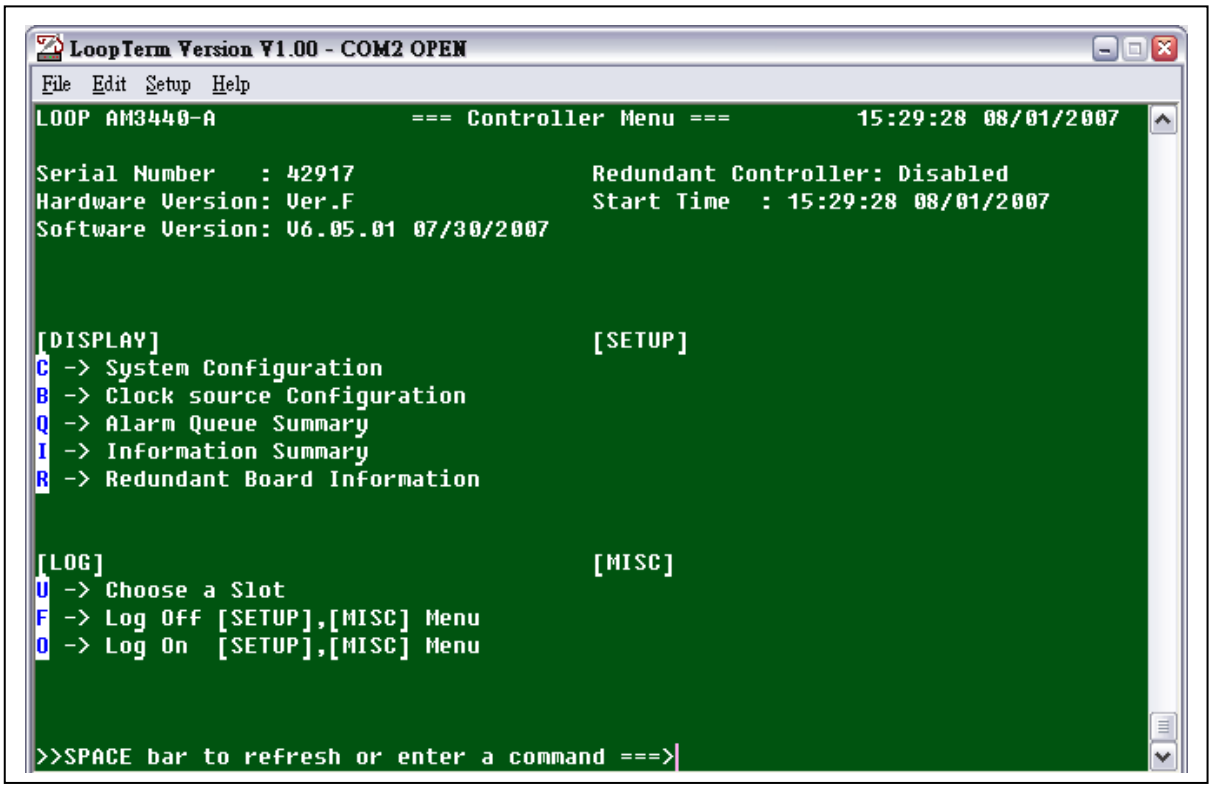


You can save the setup in any directory you choose. For the sake of convenience we saved our setup in the Loopterm file on our desktop.

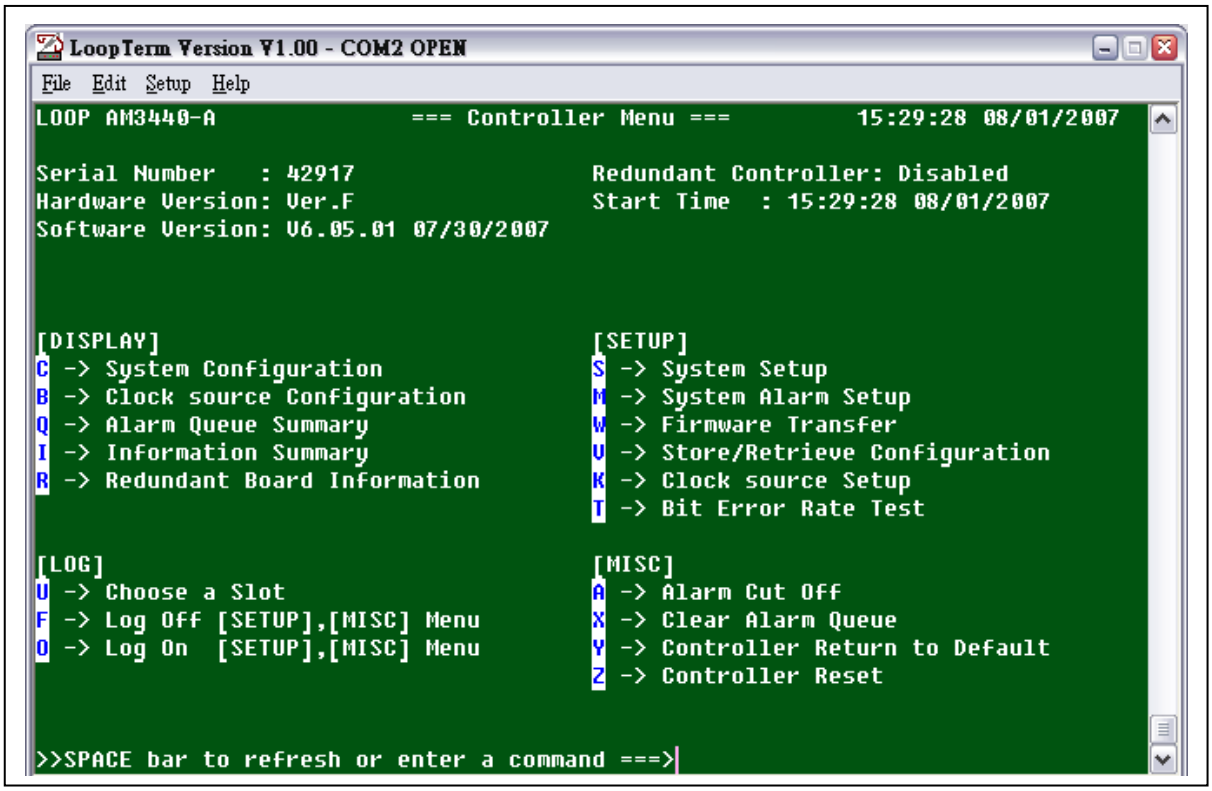


3.2 System Operation

Main menu is needed if the terminal connected to the controller. If the main menu cannot display, the user have to set the terminal parameter to default value as Table3-1.



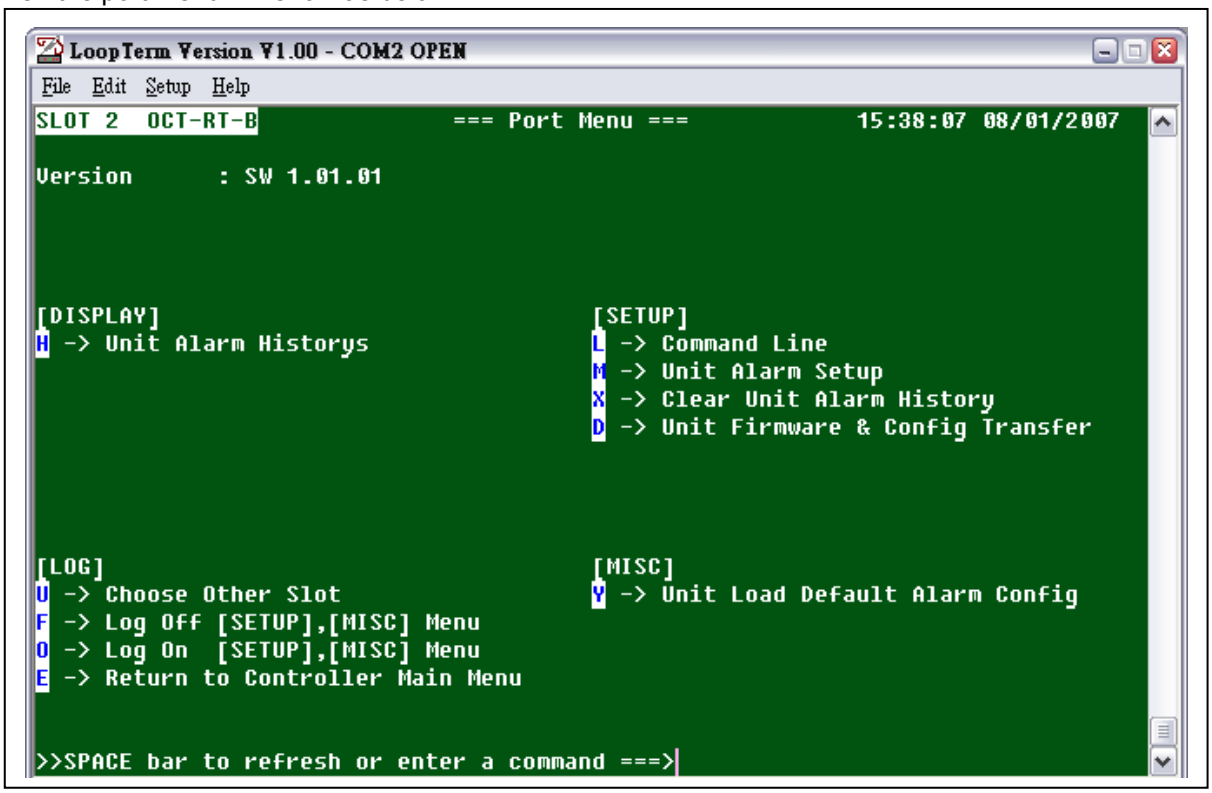
Press “O” to Log On, the following screen will show up.



Under the Controller Menu, press "U" to select a slot for the Router-B port. Then the port menu will show as below. In the example, the Router-B Card is installed in slot-2.

```
LOOP AM3440-A              === Controller Menu ===          14:16:50 11/05/2007

Serial Number    : 1014                  Redundant Controller: Enabled
Hardware Version: Ver.F                  Start Time  : 17:56:38 11/01/2007
Software Version: V7.01.01 11/01/2007    Device Name: LOOP AM3440-A



[DISPLAY]                                [SETUP]
C -> System Configuration                S -> System Setup
B -> Clock source Configuration          M -> System Alarm Setup
Q -> Alarm Queue Summary                 W -> Firmware Transfer
I -> Information Summary                 V -> Store/Retrieve Configuration
                                         K -> Clock source Setup
                                         T -> Bit Error Rate Test

[LOG]                                    [MISC]
U -> Choose a Slot                       A -> Alarm Cut Off
F -> Log Off [SETUP],[MISC] Menu         X -> Clear Alarm Queue
O -> Log On  [SETUP],[MISC] Menu         Y -> Controller Return to Default
                                         Z -> Controller Reset


==>> Input the unit number (A~D or 1~12): 2
```

Then the port menu will show as below.



Under the Port Menu, press "L" to select the command line interface. A blank screen with a flashing cursor will appear. Key in the command "exit" to return to port menu. See section 4 for further details.


LoopTerm Version V1.00 - COM2 OPEN
File Edit Setup Help
Welcome!!
Press '?' to get help!
[2]admin>

3.3 WAN Timeslot Map Setup

There are two steps for Router-B Card to setup WAN port's timeslot assignment.

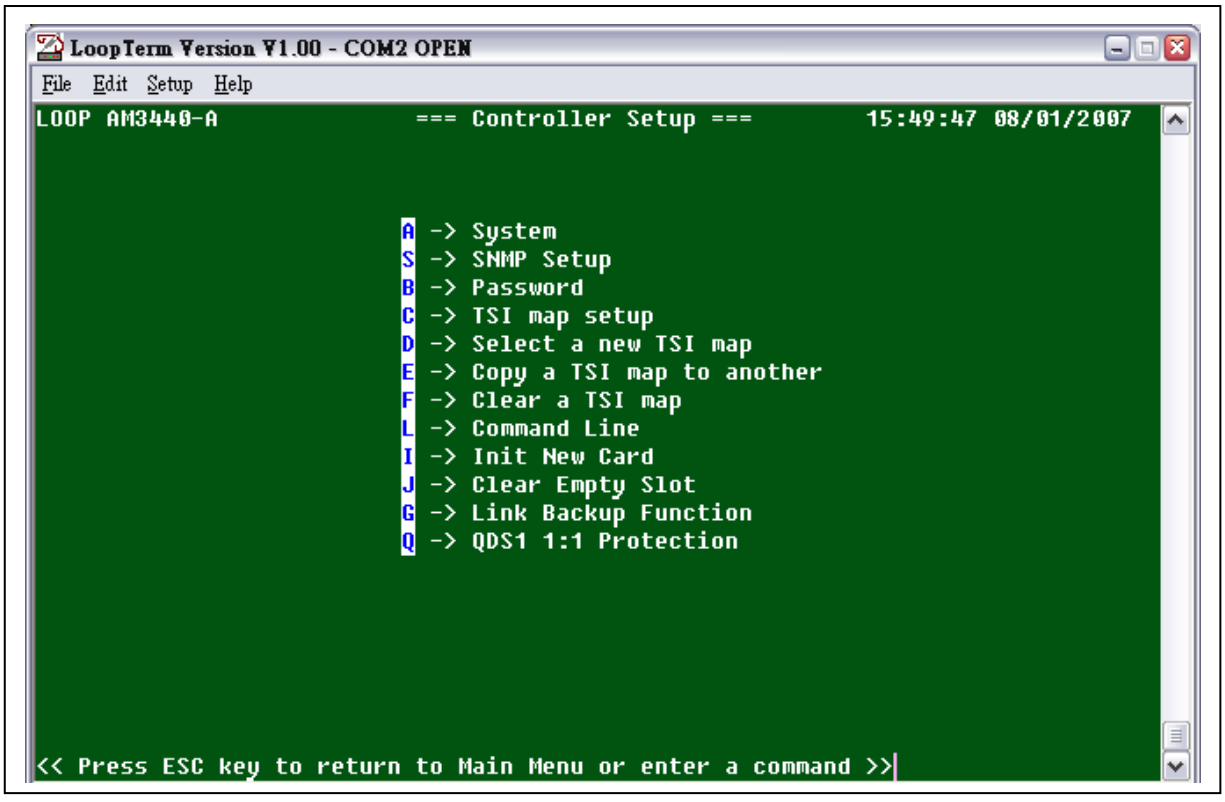
1. Set crossconnect on AM3440 controller. The Router-B supports up to 8 Mbps TDM bus.
2. CLI commands instruct the Router-B timeslot assignment for WAN ports.

3.3.1 Setting crossconnect on AM3440 Controller.

Press "S" from Controller Menu to enter Controller Setup.

```
LOOP AM3440-A              === Controller Menu ===          14:16:50 11/05/2007

Serial Number    : 1014                  Redundant Controller: Enabled
Hardware Version: Ver.F                  Start Time  : 17:56:38 11/01/2007
Software Version: V7.01.01 11/01/2007    Device Name: LOOP AM3440-A



[DISPLAY]                                [SETUP]
C -> System Configuration                S -> System Setup
B -> Clock source Configuration          M -> System Alarm Setup
Q -> Alarm Queue Summary                 W -> Firmware Transfer
I -> Information Summary                 V -> Store/Retrieve Configuration
                                         K -> Clock source Setup
                                         T -> Bit Error Rate Test

[LOG]                                    [MISC]
U -> Choose a Slot                       A -> Alarm Cut Off
F -> Log Off [SETUP],[MISC] Menu         X -> Clear Alarm Queue
O -> Log On  [SETUP],[MISC] Menu         Y -> Controller Return to Default
                                         Z -> Controller Reset


>>SPACE bar to refresh or enter a command ===>
```

The following screen will show up in Controller Setup.



Press "C" to enter TSI map Setup and the following screen will appear.

```
LOOP AM3440-A             === System Setup (MAP) ===       11:41:41 09/13/2007
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS
MAP NO: MAP_1
            Target     OCT-RTB                  Source
Target      PO/TS D SL/PO TS PO/TS D SL/PO TS  PO/TS D SL/PO TS PO/TS D SL/PO TS
Slot  :  2  ===== ========== ===== ==========  ===== ========== ===== ==========
Port  : P1      1 d             17 d
T.S.  : 01      2 d             18 d
                3 d             19 d
                4 d             20 d
T.S.# : 01      5 d             21 d
Clear : No      6 d             22 d
d/v   : d       7 d             23 d
                8 d             24 d
                9 d             25 d
Source         10 d             26 d
Slot  :        11 d             27 d
Port  :        12 d             28 d
T.S.  : 01     13 d             29 d
               14 d             30 d
Confirm?Yes    15 d             31 d
               16 d             32 d

<< Press ESC to return to Controller Setup menu, then Press D to active >>
```

Move the cursor to Target Slot and then down to Target Port. The following screen will appear.

```
LOOP AM3440-A             === System Setup (MAP) ===       11:45:05 09/13/2007
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS
MAP NO: MAP_1
            Target     OCT-RTB                  Source
Target      PO/TS D SL/PO TS PO/TS D SL/PO TS  PO/TS D SL/PO TS PO/TS D SL/PO TS
Slot  :  2  ===== ========== ===== ==========  ===== ========== ===== ==========
Port  : P1   1  1 d  4  1  1  1 17 d  4  1 17
T.S.  : 01   1  2 d  4  1  2  1 18 d  4  1 18
             1  3 d  4  1  3  1 19 d  4  1 19
             1  4 d  4  1  4  1 20 d  4  1 20
T.S.# : 01   1  5 d  4  1  5  1 21 d  4  1 21
Clear : No   1  6 d  4  1  6  1 22 d  4  1 22
d/v   : d    1  7 d  4  1  7  1 23 d  4  1 23
             1  8 d  4  1  8  1 24 d  4  1 24
             1  9 d  4  1  9  1 25 d  4  1 25
Source       1 10 d  4  1 10  1 26 d  4  1 26
Slot  :  4   1 11 d  4  1 11  1 27 d  4  1 27
Port  :      1 12 d  4  1 12  1 28 d  4  1 28
T.S.  : 01   1 13 d  4  1 13  1 29 d  4  1 29
             1 14 d  4  1 14  1 30 d  4  1 30
Confirm?Yes  1 15 d  4  1 15  1 31 d  4  1 31
             1 16 d  4  1 16    32 d

<< Press ESC to return to Controller Setup menu, then Press D to active >>
```

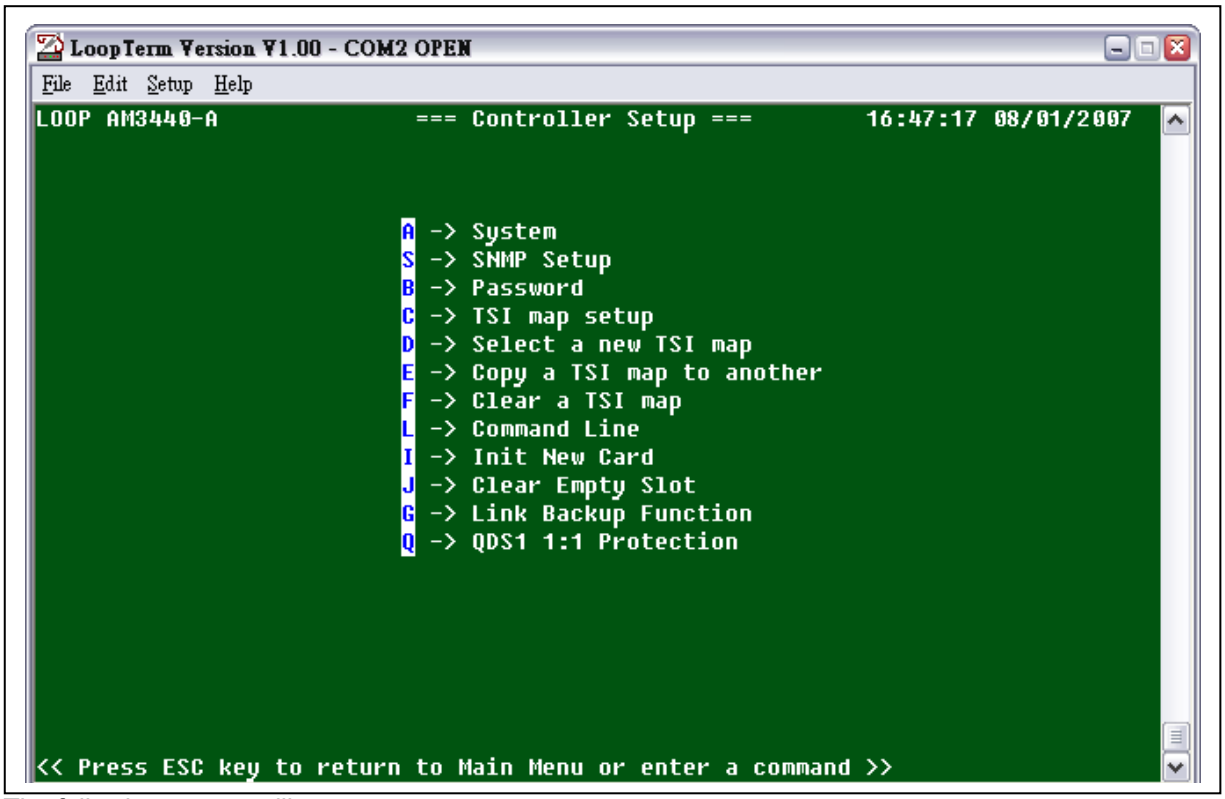
Move the cursor to Source Slot and then down to Source Port.

```
LOOP AM3440-A             === System Setup (MAP) ===       11:46:37 09/13/2007
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS
MAP NO: MAP_1
            Target     OCT-RTB                  Source
Target      PO/TS D SL/PO TS PO/TS D SL/PO TS  PO/TS D SL/PO TS PO/TS D SL/PO TS
Slot  :  2  ===== ========== ===== ==========  ===== ========== ===== ==========
Port  : P1   1  1 d  4  1  1  1 17 d  4  1 17
T.S.  : 01   1  2 d  4  1  2  1 18 d  4  1 18
             1  3 d  4  1  3  1 19 d  4  1 19
             1  4 d  4  1  4  1 20 d  4  1 20
T.S.# : 01   1  5 d  4  1  5  1 21 d  4  1 21
Clear : No   1  6 d  4  1  6  1 22 d  4  1 22
d/v   : d    1  7 d  4  1  7  1 23 d  4  1 23
             1  8 d  4  1  8  1 24 d  4  1 24
             1  9 d  4  1  9  1 25 d  4  1 25
Source       1 10 d  4  1 10  1 26 d  4  1 26
Slot  :      1 11 d  4  1 11  1 27 d  4  1 27
Port  :      1 12 d  4  1 12  1 28 d  4  1 28
T.S.  : 01   1 13 d  4  1 13  1 29 d  4  1 29
             1 14 d  4  1 14  1 30 d  4  1 30
Confirm?Yes  1 15 d  4  1 15  1 31 d  4  1 31
             1 16 d  4  1 16    32 d

<< Press ESC to return to Controller Setup menu, then Press D to active >>
```

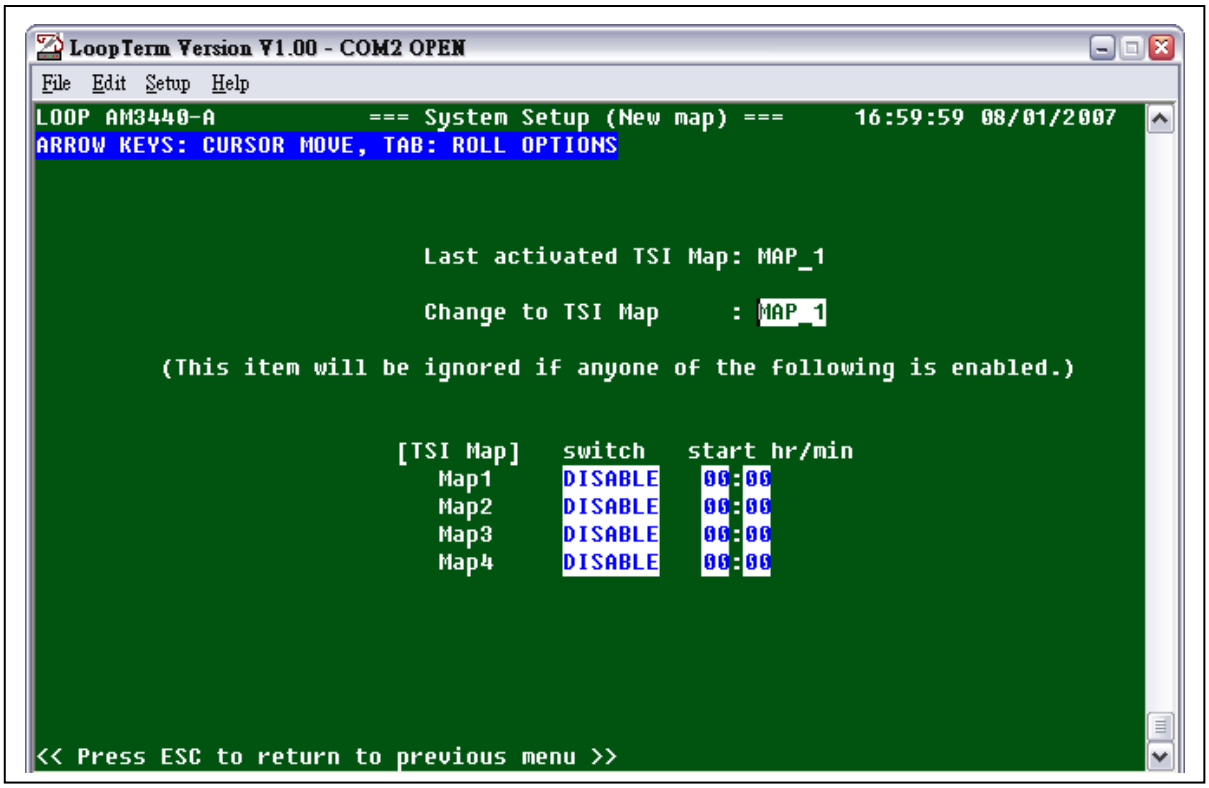
The following screen will appear.

```
LOOP AM3440-A             === System Setup (MAP) ===       11:46:37 09/13/2007
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS
MAP NO: MAP_1
            Target     OCT-RTB                  Source     Quad-E1 NON-CAS
Target      PO/TS D SL/PO TS PO/TS D SL/PO TS  PO/TS D SL/PO TS PO/TS D SL/PO TS
Slot  :  2  ===== ========== ===== ==========  ===== ========== ===== ==========
Port  : P1   1  1 d  4  1  1  1 17 d  4  1 17   1  1 d  2  1  1  1 17 d  2  1 17
T.S.  : 01   1  2 d  4  1  2  1 18 d  4  1 18   1  2 d  2  1  2  1 18 d  2  1 18
             1  3 d  4  1  3  1 19 d  4  1 19   1  3 d  2  1  3  1 19 d  2  1 19
             1  4 d  4  1  4  1 20 d  4  1 20   1  4 d  2  1  4  1 20 d  2  1 20
T.S.# : 31   1  5 d  4  1  5  1 21 d  4  1 21   1  5 d  2  1  5  1 21 d  2  1 21
Clear : No   1  6 d  4  1  6  1 22 d  4  1 22   1  6 d  2  1  6  1 22 d  2  1 22
d/v   : d    1  7 d  4  1  7  1 23 d  4  1 23   1  7 d  2  1  7  1 23 d  2  1 23
             1  8 d  4  1  8  1 24 d  4  1 24   1  8 d  2  1  8  1 24 d  2  1 24
             1  9 d  4  1  9  1 25 d  4  1 25   1  9 d  2  1  9  1 25 d  2  1 25
Source       1 10 d  4  1 10  1 26 d  4  1 26   1 10 d  2  1 10  1 26 d  2  1 26
Slot  :  4   1 11 d  4  1 11  1 27 d  4  1 27   1 11 d  2  1 11  1 27 d  2  1 27
Port  : P1   1 12 d  4  1 12  1 28 d  4  1 28   1 12 d  2  1 12  1 28 d  2  1 28
T.S.  : 01   1 13 d  4  1 13  1 29 d  4  1 29   1 13 d  2  1 13  1 29 d  2  1 29
             1 14 d  4  1 14  1 30 d  4  1 30   1 14 d  2  1 14  1 30 d  2  1 30
Confirm?Yes  1 15 d  4  1 15  1 31 d  4  1 31   1 15 d  2  1 15  1 31 d  2  1 31
             1 16 d  4  1 16    32 d            1 16 d  2  1 16

<< Press ESC to return to Controller Setup menu, then Press D to active >>
```

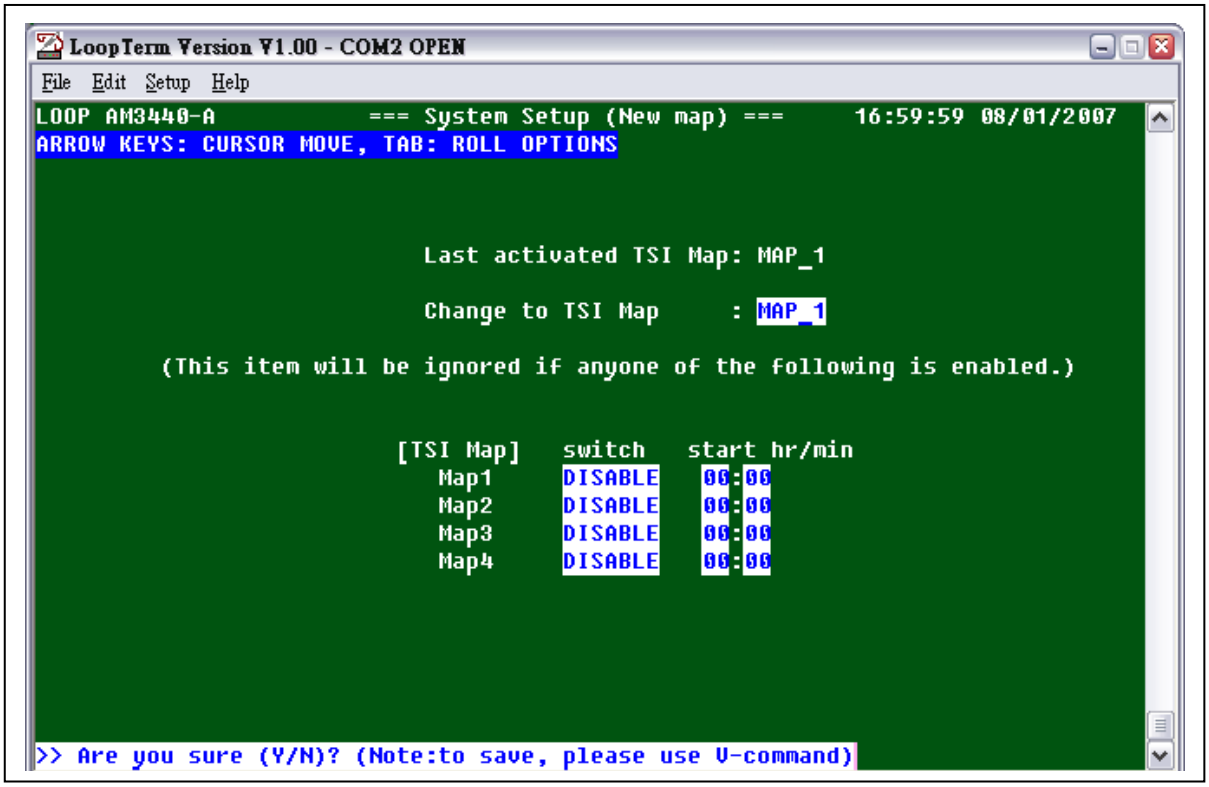
Press ESC to return to Controller Setup Menu. Press “D” from Controller Setup and go to Select a new TSI map.



The following screen will appear.



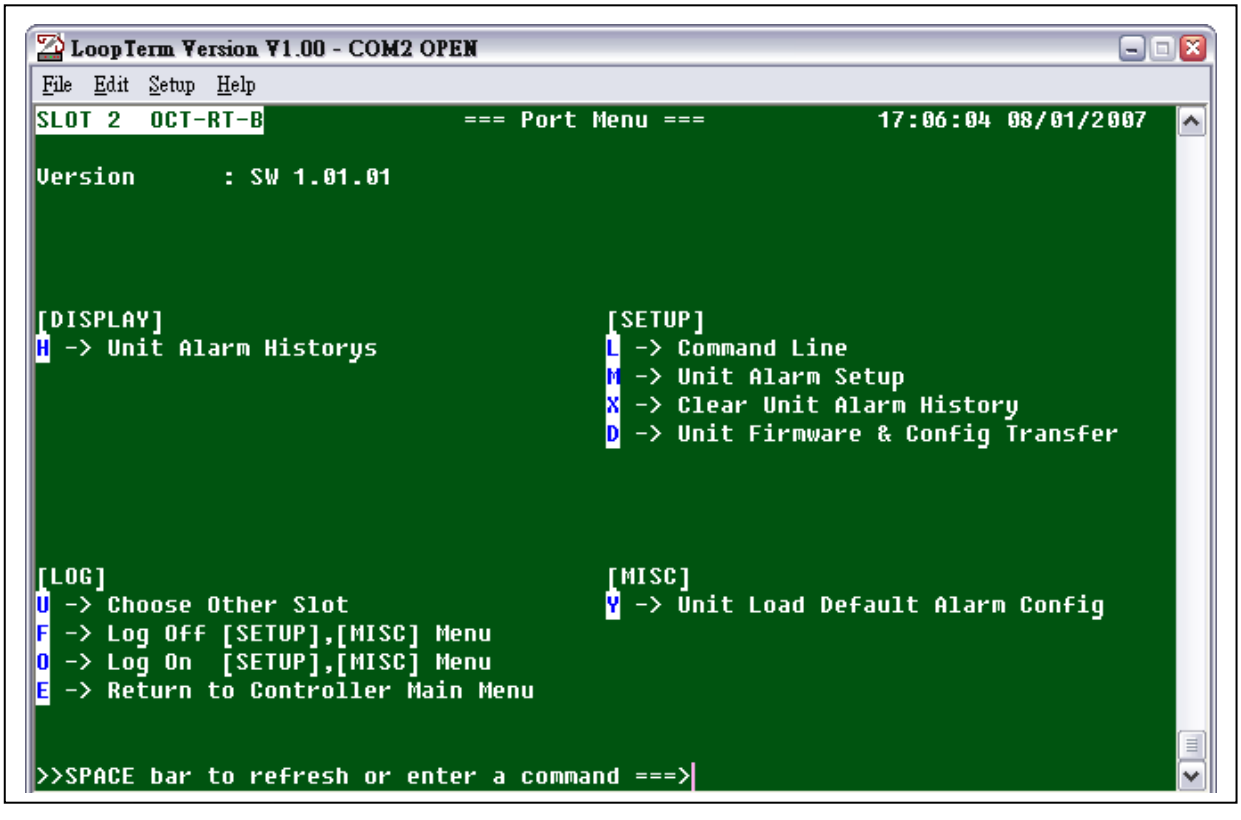
Press ESC and press “Y” to activate TSI MAP setting.



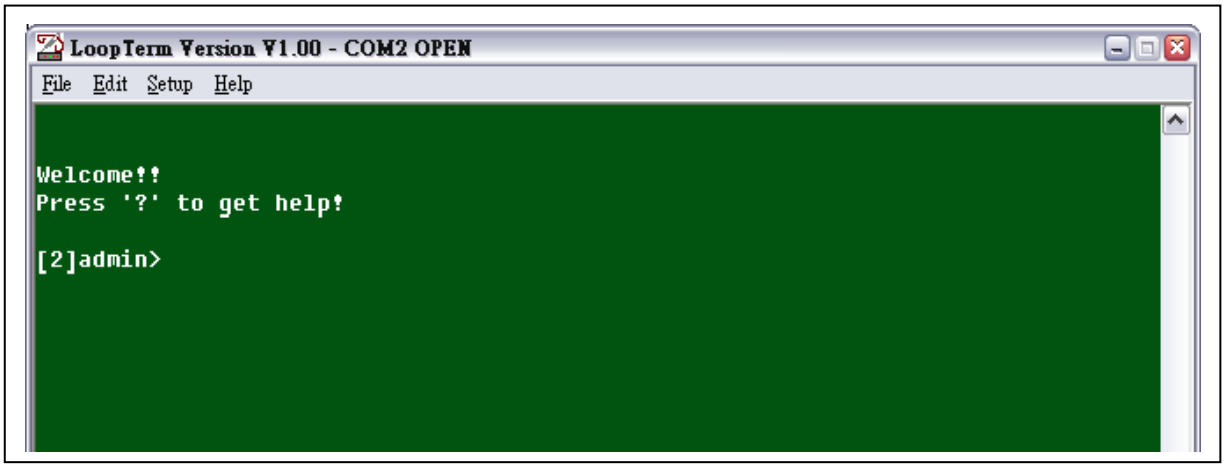
Note: Router-B Card and Quad-E1 card do the MAP setting in Port 1. Now the MAP setting is now complete.

3.3.2 Assigning timeslots for a WAN port on Router-B card.

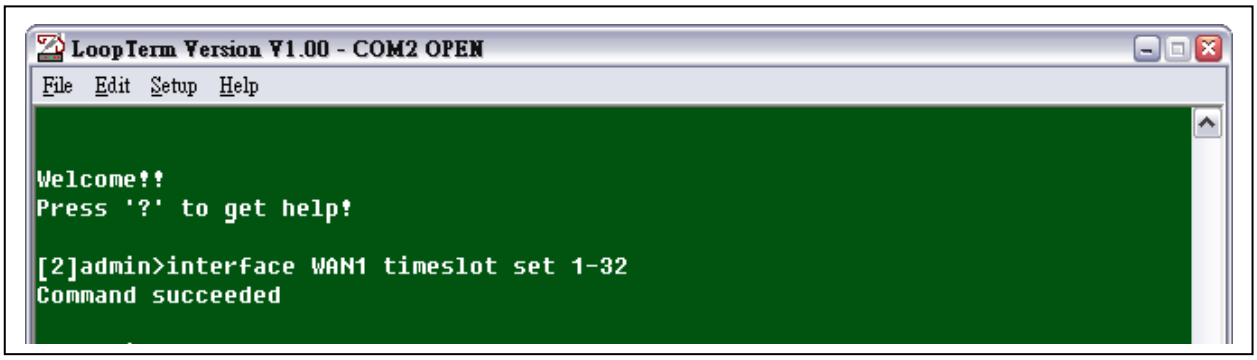
After the user setup the AM3440 TSI MAP in main board, please go to Router-B card’s Port Menu to select Router-B Card and set the timeslot in order for the user to crossconnect the Controller card with Router-B card.



Press “L” from Port Menu and go to Command Line screen.



A blank screen with a flashing cursor will appear. Key in the command **interface WAN1 timeslot set 1-32**.



3.3 Effecting New Configuration

All changes of Router-B card configuration take effect imediately except for the following feature: **system activate routing and configuration download**. The feature take effect after the unit is powered down and then powered up again.

3.4 LED Operation

The front panel of the Router-B has two LEDs for each LAN port They are for: Ethernet Link/Active, and Ethernet speed. LED Indications are listed in Table 3-2, below.

Table 3- 2 Front Panel LED Indication

LED		Color	Indication
L A N	LINK/ ACT	Off Green Flashing Green	No Ethernet connection or Link fail Link Active
	10/100	Off Green	10Mbps 100Mbps

Table 3- 3 Front Panel Active LED Indication

LED	Color	Indication
Active LED	Off Green Amber	Power Off System is functioning Power on self test

4 PPP/MLPPP

4.1 Overview

Multilink PPP can connect multiple links between two systems as needed to provide extra bandwidth. Remotely accessing resources through PPP Multilink allows for the increase in overall throughput by combining the bandwidth of two or more physical communication links.

Example: To bundle the four WAN interfaces (WAN1~WAN4) in a virtual interface(m1) and make the virtual interface become bridge mode. When the data packets transmit from LAN to bundle interface, MLPPP will split and recombine the packets and transmit to WAN1~WAN4.

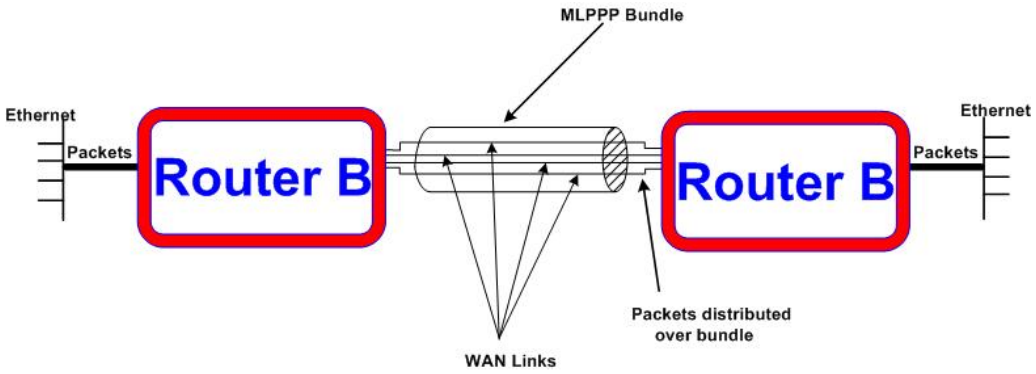


Figure 4- 1 MLPPP Application

4.2 Step by Step Setup Instructions

Router B card supports multiple WAN interfaces. Before configuring each WAN interface, it needs to setup the timeslot map in advance.

Key in the command **interface WANXX timeslot set** to assgin 128 timeslots to all WAN interfaces.

```
[2]admin>interface WAN1 timeslot add 1-32
Command succeeded

[2]admin>interface WAN2 timeslot add 33-64
Command succeeded

[2]admin>interface WAN3 timeslot add 65-95
Command succeeded

[2]admin>interface WAN4 timeslot add 97-128
Command succeeded
```

Set the interfaces to use PPP for layer-two encapsulation.

```
[2]admin>interface WAN1 encapsulation ppp
Command succeeded

[2]admin>interface WAN2 encapsulation ppp
Command succeeded

[2]admin>interface WAN3 encapsulation ppp
Command succeeded

[2]admin>interface WAN4 encapsulation ppp
Command succeeded
```

Create a virtual bundle m1 by command **multilink create**.

```
[2]admin>multilink create m1
Command succeeded
```

Join all the WAN ports to be members of the bundle m1.
Note: the configuration on those interfaces will be cleared to default.

```
[2]admin>multilink virtual m1 add WAN1 WAN2 WAN3 WAN4
The configurations of bundled interface(s) have been cleared!
Command succeeded
```

Create a bridge group. Following command show an example that creates a bridge without a specifying a MAC address. In the case, the Router B card randomly generates a MAC address for the group.

```
[2]admin>bridge create br1
WARNING: A MAC address has been randomly generated for bridge group!  It might
conflict
with other device!!
Command succeeded
```

Add lan1 and m1 into bridge.

```
[2]admin>bridge br1 add lan1 m1
Command succeeded
```

5 ROUTER-B CARD SETUP

5.1 Configuration -Save and Reset

5.1.1 Save the configuration

The Router-B card stores all configuration changes in volatile RAM. After the device reboots, all the changes will be gone. In order to save this configuration, key in the admin comand **system configuration save** and then press the Enter key. The startup configuration is stored as a CLI script.

Note: The shartup configuration saving space is about 895K.

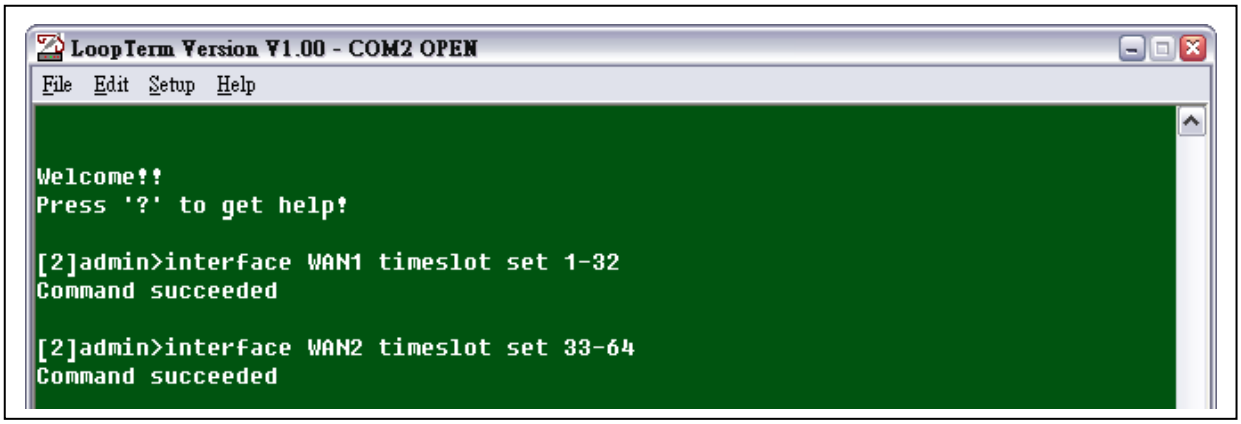
5.1.2 Resetting the Configuraton

To restore factory settings in the future use the command **system configuration reset**. The command resets the configuration to the factory default setting and then reboots the card.

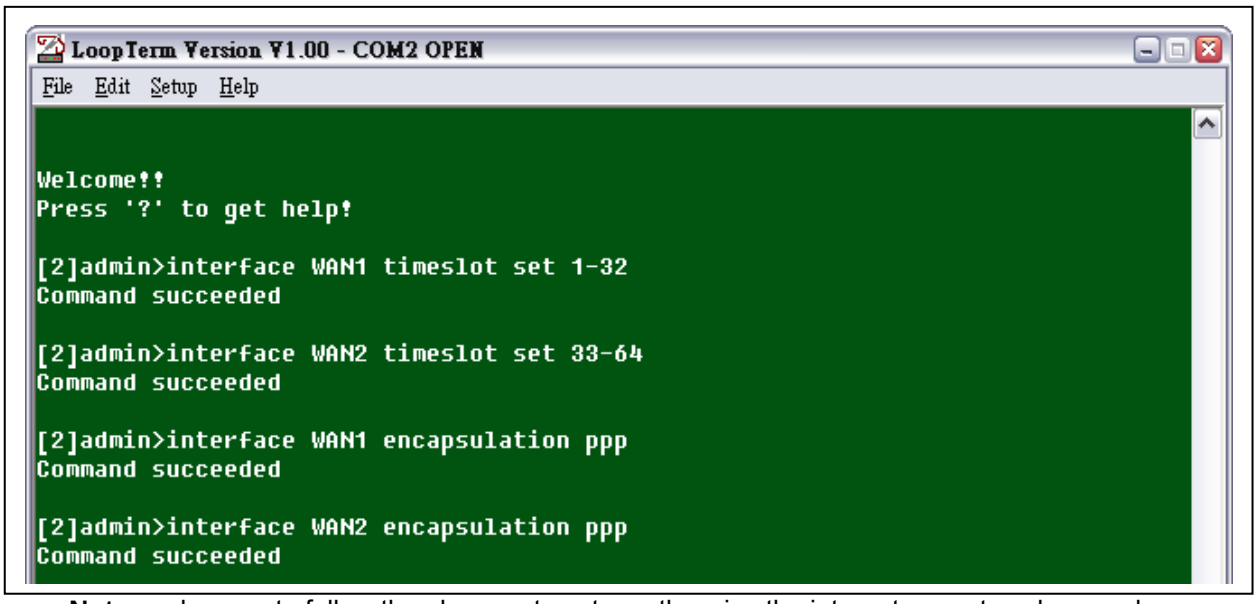
5.2 WAN Interface Setup

Router-B card supports mutiple WAN interfaces. Before configuring each WAN interface, it needs to setup the timeslot map in advance.

Key in the command **interface WAN1 and WAN2 timeslot set** to assgin timeslots to WAN interface WAN1. The following example assigns 32 timeslots to interface WAN1 from timeslot 1 to timeslot 32 and 32 timeslots (33-64) to interface WAN2.



The following example shows how to configure the encapsulation PPP on interface WAN1 and WAN2.



Note: make sure to follow the above setup step, otherwise the internet cannot work properly.

The above settings are the basic settings for a valid WAN interface.
An interface can be in either router mode or bridge mode, the following sections show how to set the interface to router mode and bridge mode.

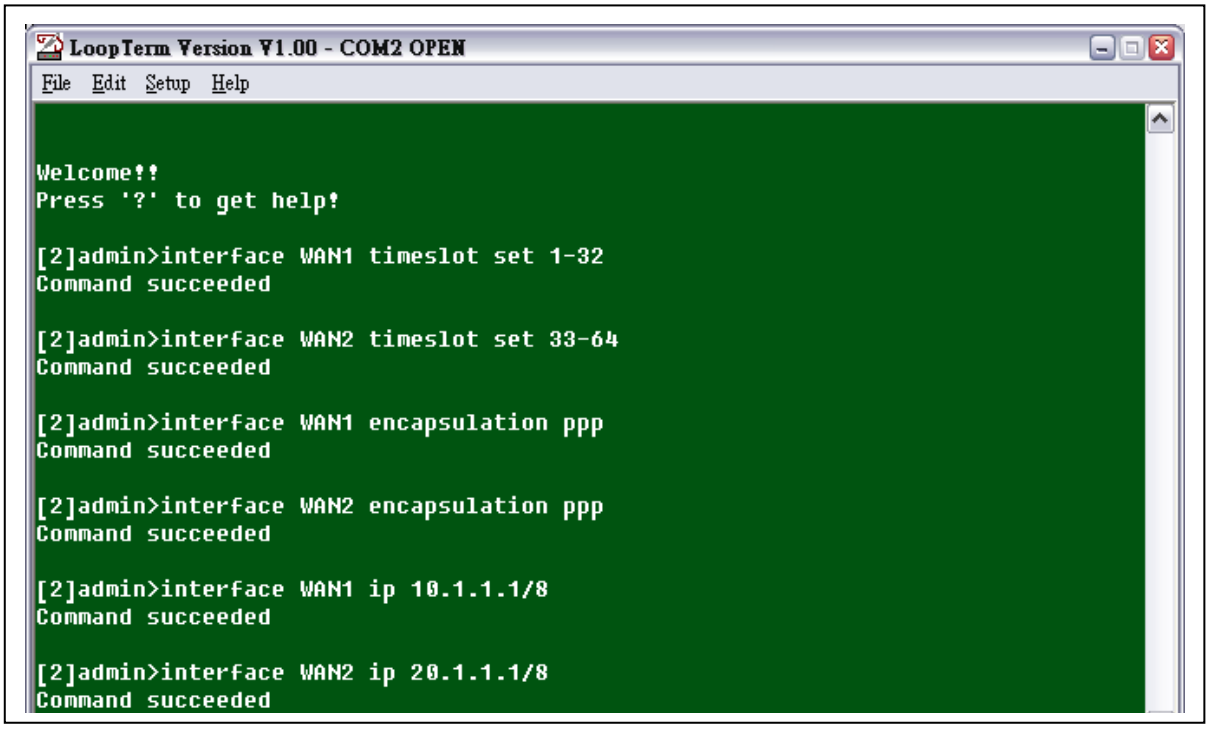
5.2.1 Interfaces in bridge mode

To set any interfaces to bridge mode, a bridge group must be created. After creating the bridge group, for example br1, key in the admin command **bridge br1 add WAN1** and press the enter key. Then the WANxx interface will be in bridge mode and belong to the bridge group br1.

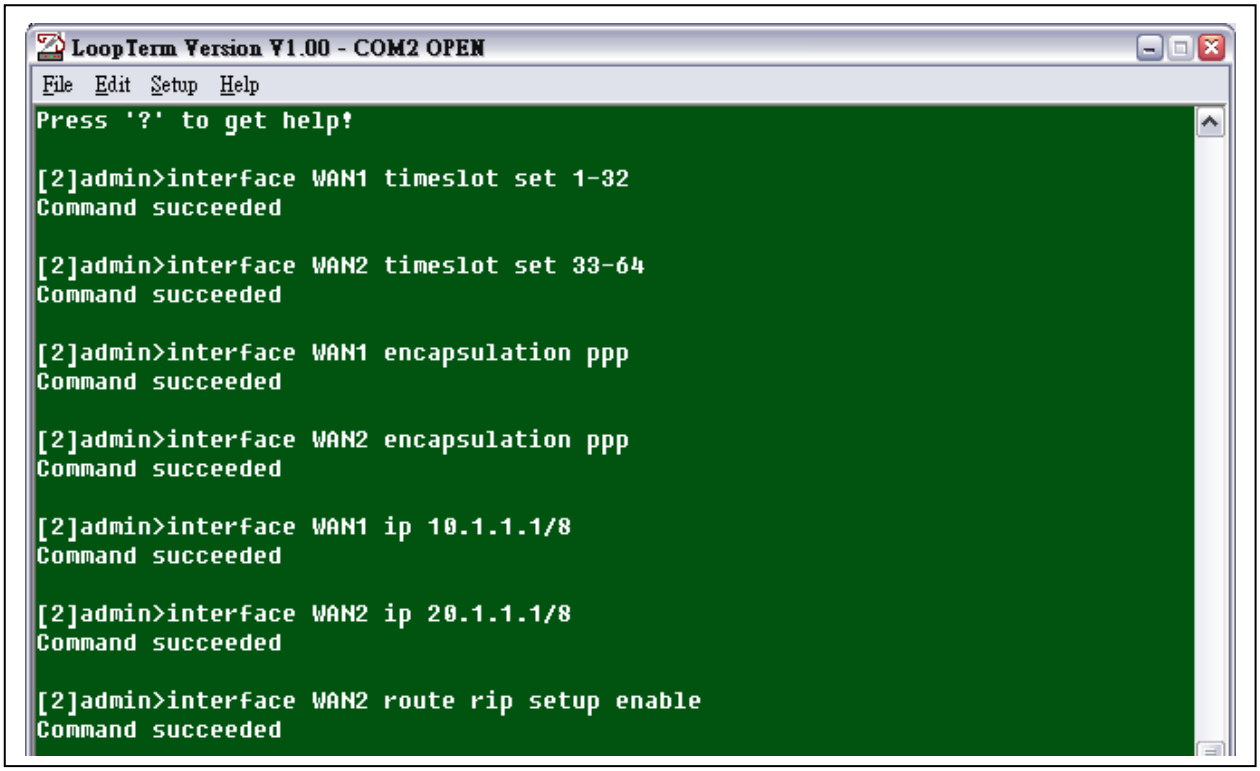
5.2.2 Interfaces in router mode

To assign an IP address and subnet mask to the WAN interfaces, key in the admin command **interface WAN1 ip and WAN2 ip** followed by the IP address and subnet mask. In the following screen below, interface wan1 is assigned an IP address 10.1.1.1 with subnet mask 255.0.0.0 and interface wan2 is assigned an IP address 20.1.1.1 with subnet mask 255.0.0.0.

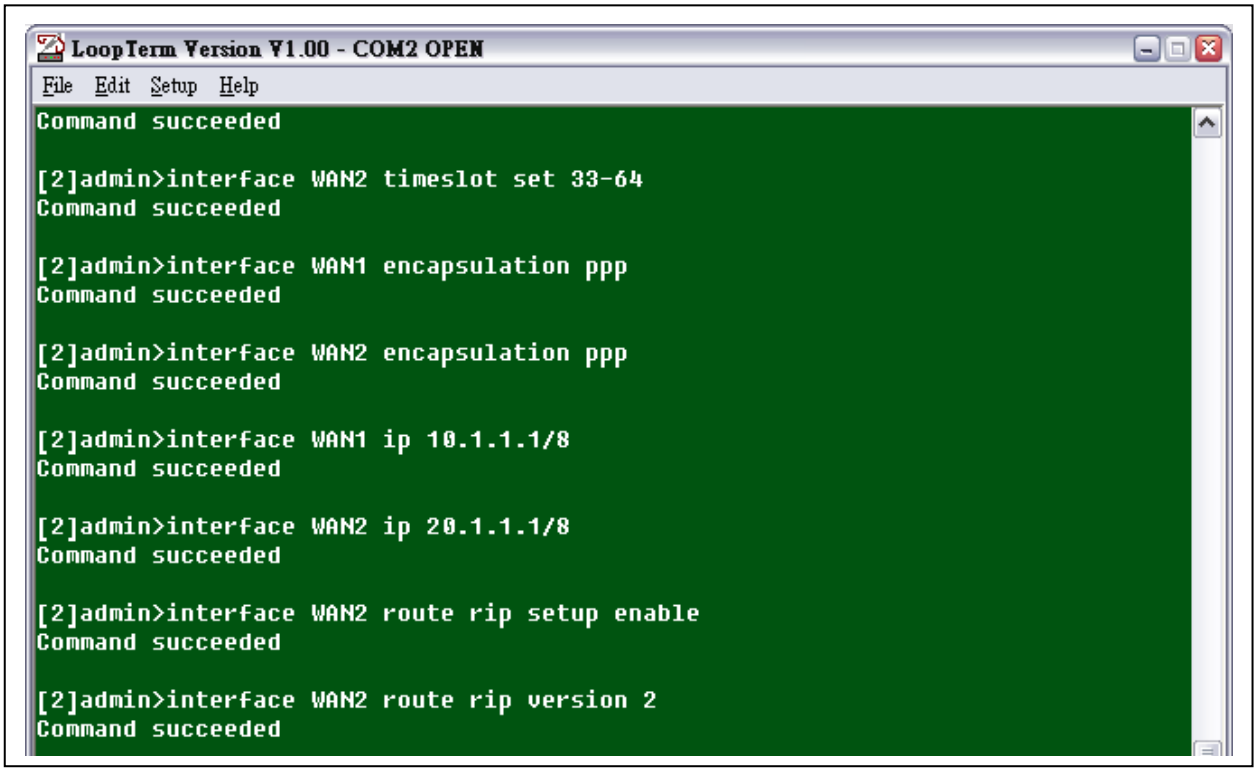
Note: WAN interface could be in bridge mode as default. The user can key in the admin command **show interface WAN1 configuration** to check current mode. To switch to router mode, key in the command **bridge xxx delete WAN1**.



The users may enable the RIP routing protocol to allow Router-B card automatically exchange dynamical routing tables with other RIP-enabled routers. To enable RIP routing protocol, key in the command **interface WAN1 and WAN2 route rip setup enable**.



Router-B card supports both RIP version 1 and RIP version 2. The default version is version 2 in Router-B card. To change the RIP version, key in the command **interface WAN2 route rip version**.



5.3 LAN interface Setup

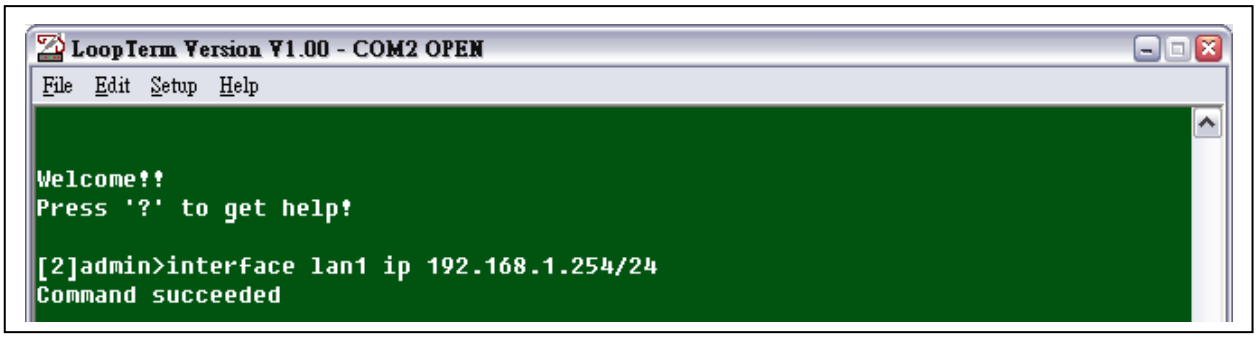
An interface can be either in router mode or bridge mode, the following sections shows how to set the interface to router mode and bridge mode.

5.3.1 Interfaces in bridge mode

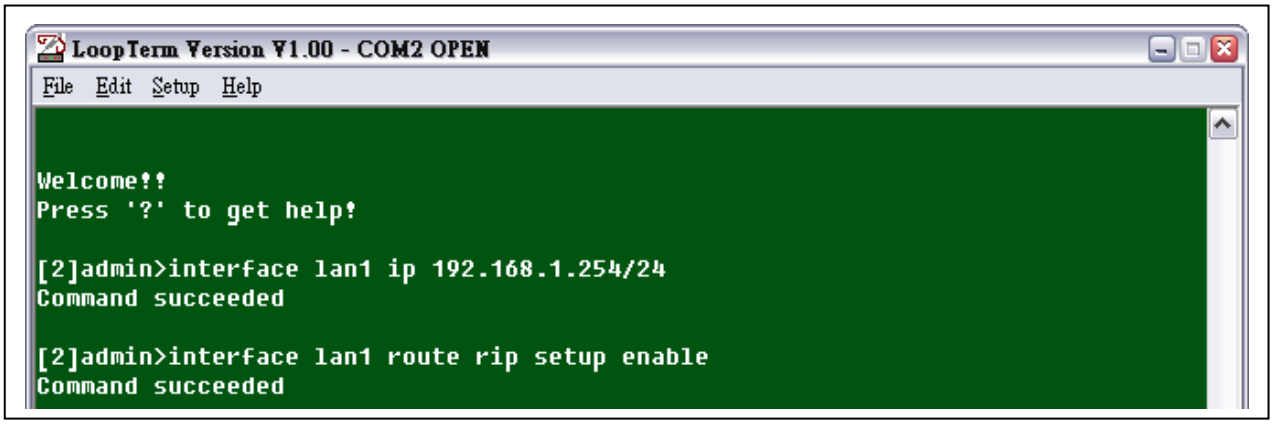
To set any interfaces to bridge mode, a bridge group must be created. Please refer to Chapter 14 for details. After creating the bridge group, for example br1, key in the admin command **bridge br1 add lan1** and press the enter key. Then the LAN1 interface will be in bridge mode and belong to the bridge group br1.

5.3.2 Interfaces in router mode

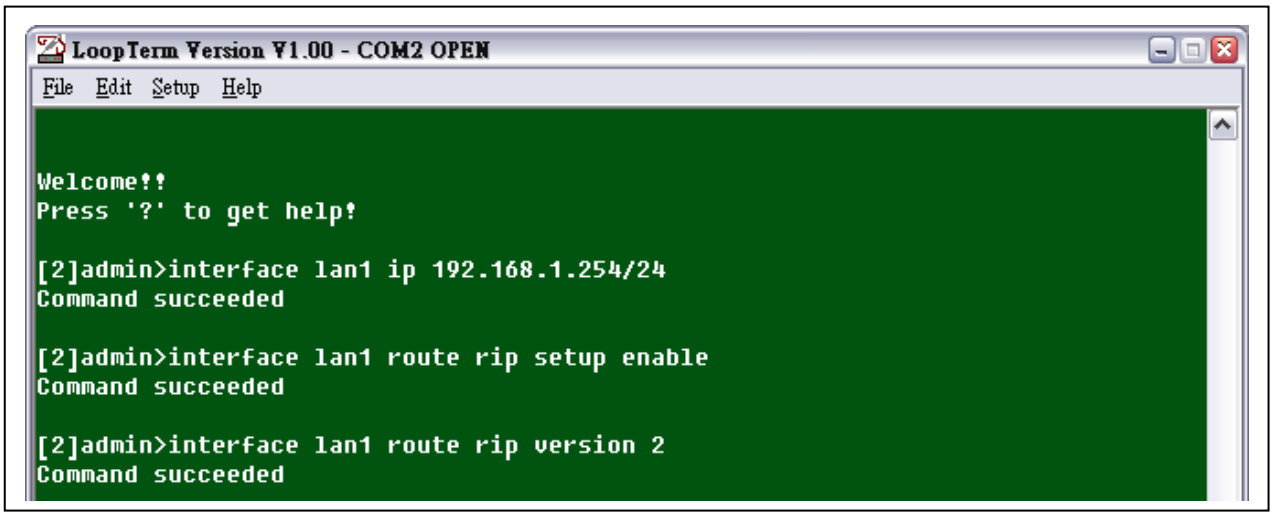
To assign an IP address and subnet mask to the LAN interfaces, key in the admin command **interface lan1 ip** followed by the IP address and subnet mask. In the following screen below interface lan1 is assigned with IP address 192.168.1.254 with subnetmask 255.255.255.0.



The users may enable the RIP routing protocol to allow Router-B card automatically exchange dynamical routing tables with other RIP-enabled routers. To enable RIP routing protocol, key in the command **interface lan1 route rip setup enable**.



Router-B card supports both RIP version 1 and RIP version 2. The default version in Router-B card is version 2. To change the RIP version, key in the command **interface lan1 route rip version.**


LoopTerm Version V1.00 - COM2 OPEN
File Edit Setup Help
Welcome!!
Press '?' to get help!
[2]admin>interface lan1 ip 192.168.1.254/24
Command succeeded
[2]admin>interface lan1 route rip setup enable
Command succeeded
[2]admin>interface lan1 route rip version 2
Command succeeded

6 Frame Relay Setup

6.1 Overview

Each Router-B WAN port can support multiple Frame Relay PVCs up to 16. The maximum number of PVCs in a Router-B card is 64. Figure 6-1, below, illustrates a Frame Relay setup. The dashed lines in the diagram represent Frame Relay PVCs.

Note: Router-B cards only support user site protocol and cannot communicate directly with each other. They must be connected to a Frame Relay network that includes devices that run on FR network protocol. The Loop-AM3440 Frame Relay card can be used as such a device.

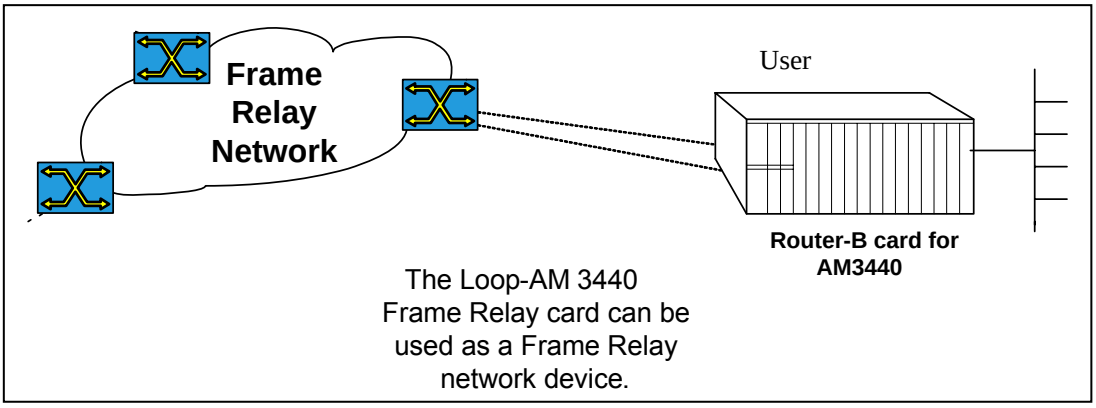
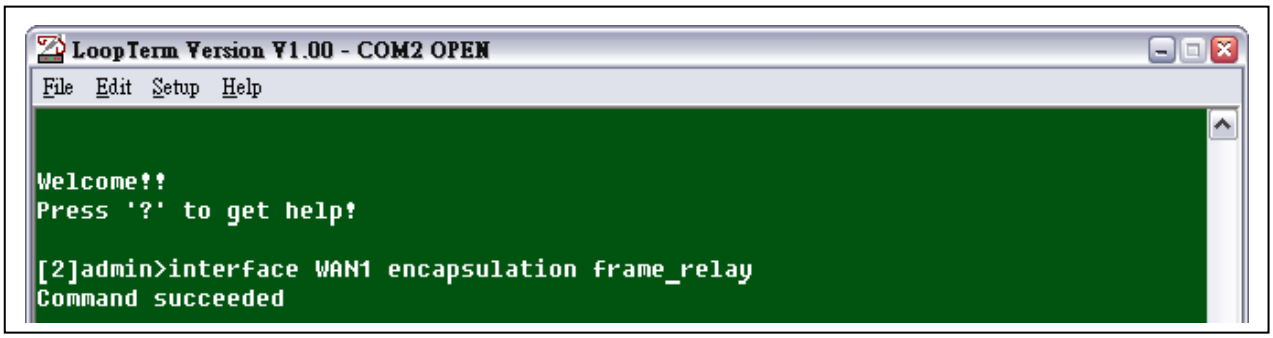


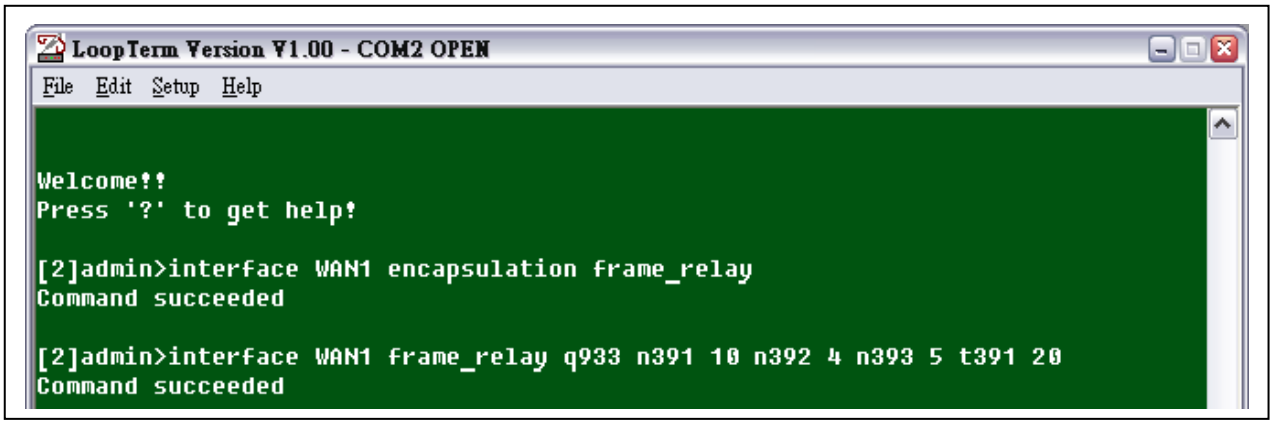
Figure 6- 1 Frame Relay Application

6.2 Step by Step Setup Instructions

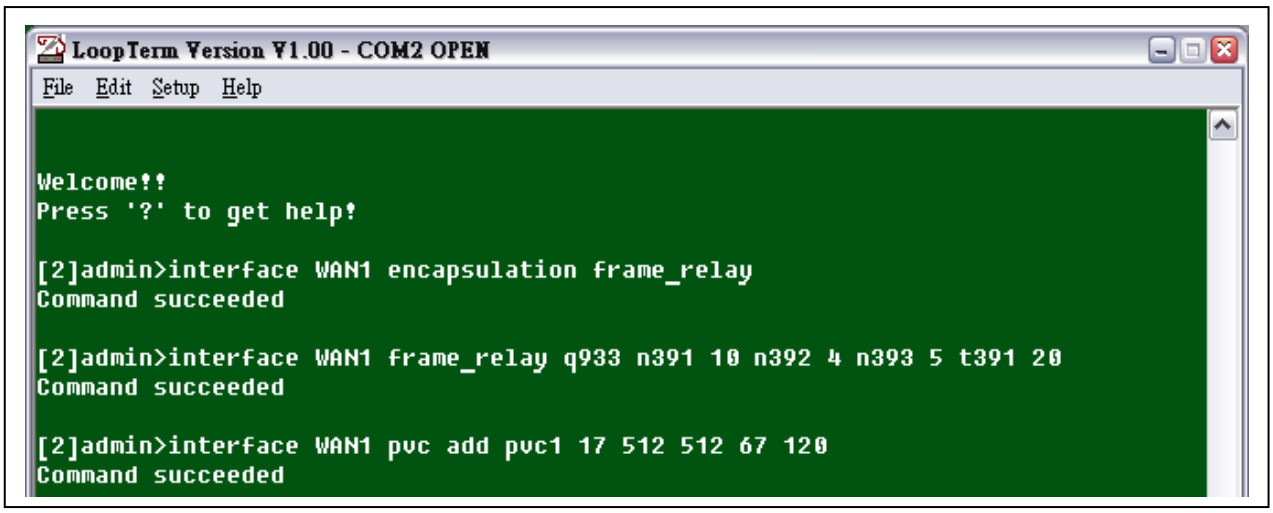
Set the WAN port to run Frame Relay.



Set Frame Relay polling protocol as Q.933 Annex A and its parameters **n391, n392, n393, and t391**. Please note that these parameters must match the parameters on the network side.



Then create a PVC and set its bandwidth parameters.

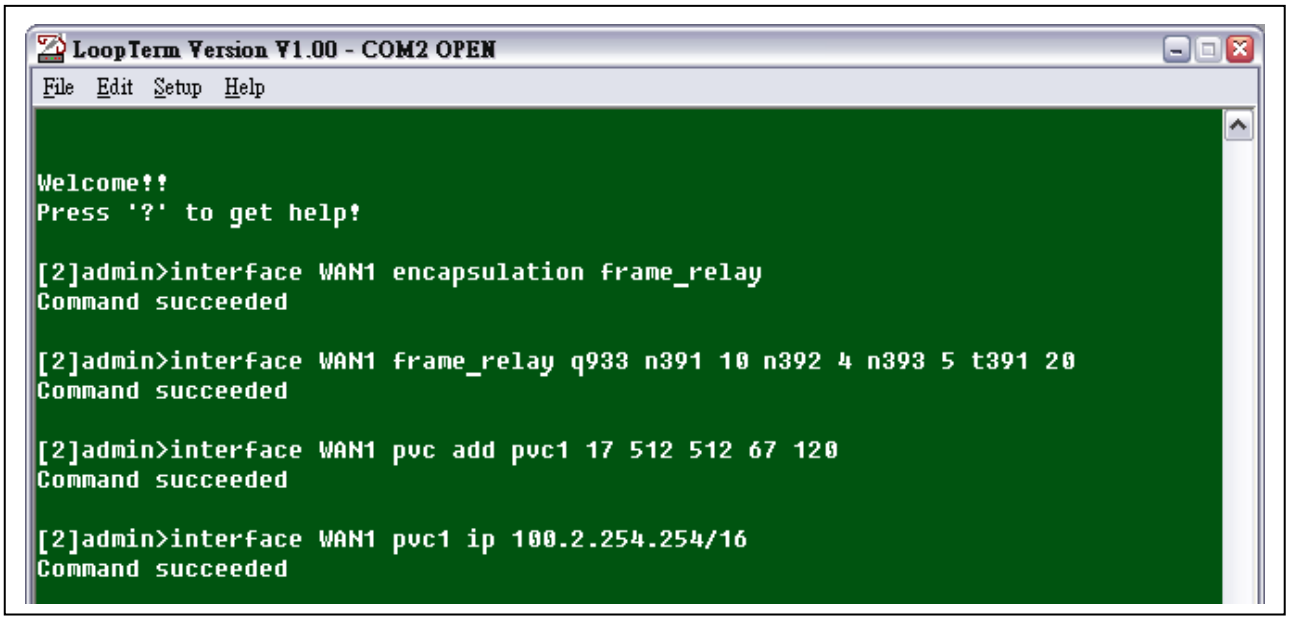


Note: In the above screen the first **512** is the value for the CIR (Committed Information Rate in Kbps) of PVC1. The total sum of the CIR values for all PVCs must not exceed the total physical bandwidth of the WAN port. Physical bandwidth can be calculated by using the formula.

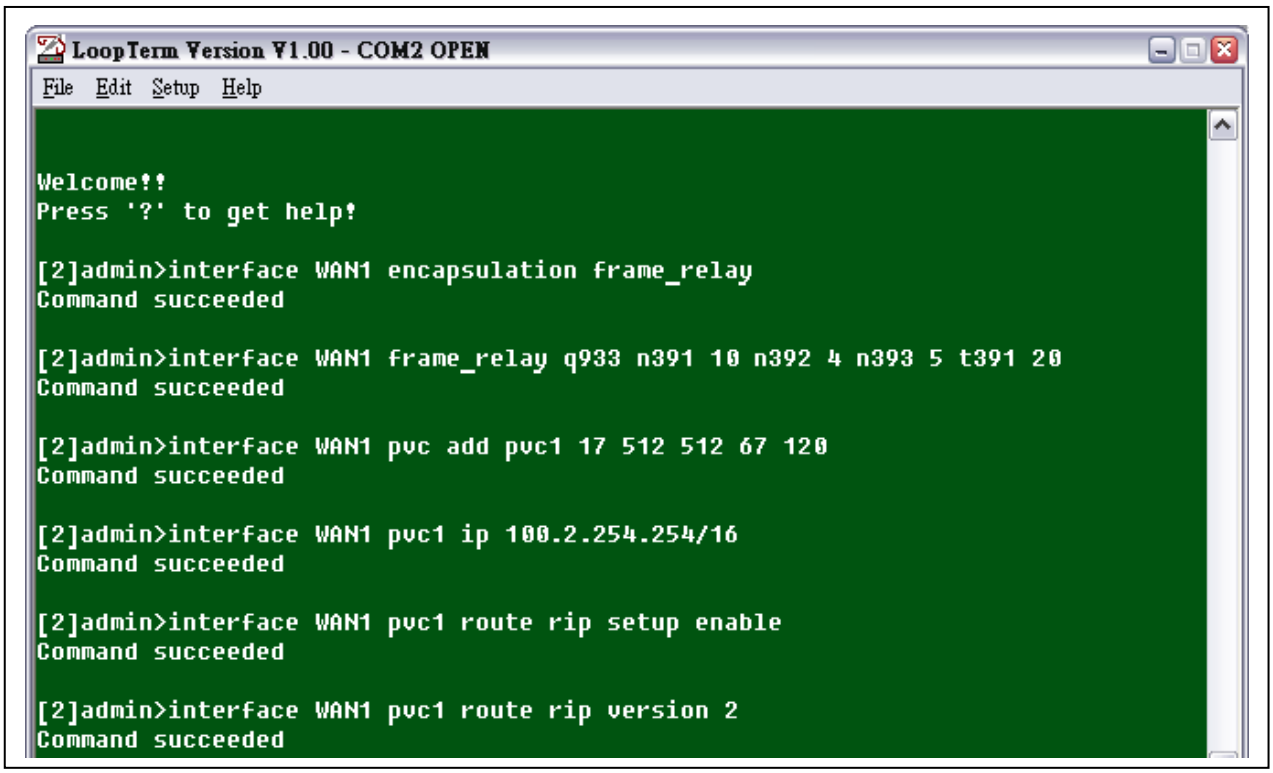
Physical bandwidth= n (Where n represents number of timeslots assigned for the WAN port) **x 64k**.

If you are not sure how many timeslots you used in your WAN port mapping, you can check by using the command **show timeslot**.

Assign an IP address for the PVC.



A PVC can also run a dynamic routing protocol. In following example, RIP II is enabled.



This setup procedure is now complete.

7 IP Routing Setup

7.1 Overview

Figure 7-1 below illustrates the Router-B card being used in router mode. The IP address and gateway address used in the diagram correspond to the sample step by step configuration instructions in Section 7.2.

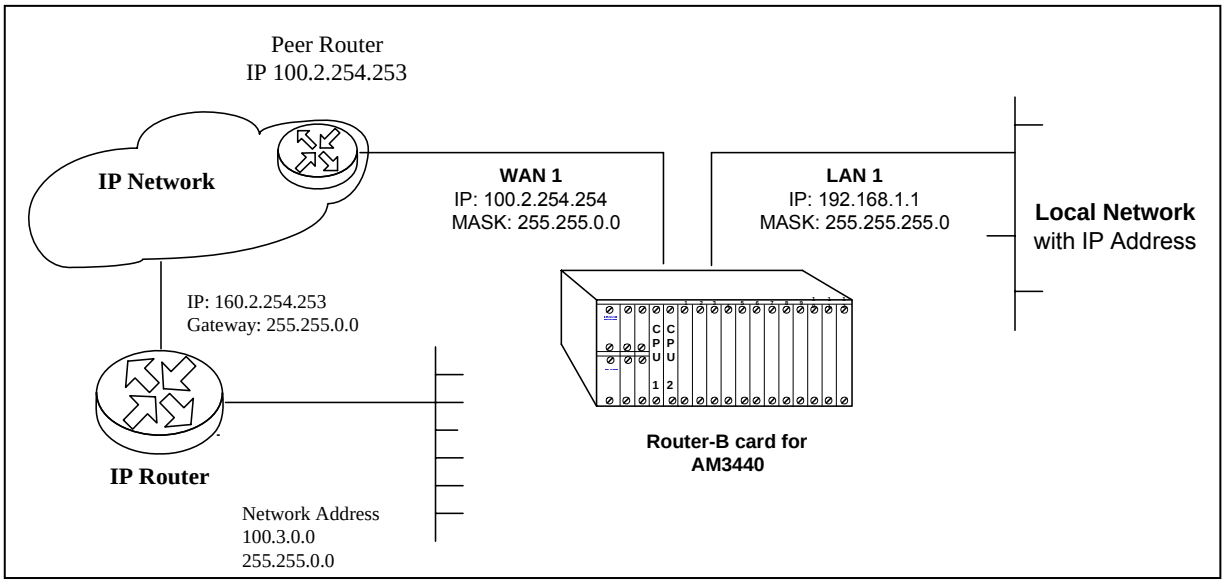
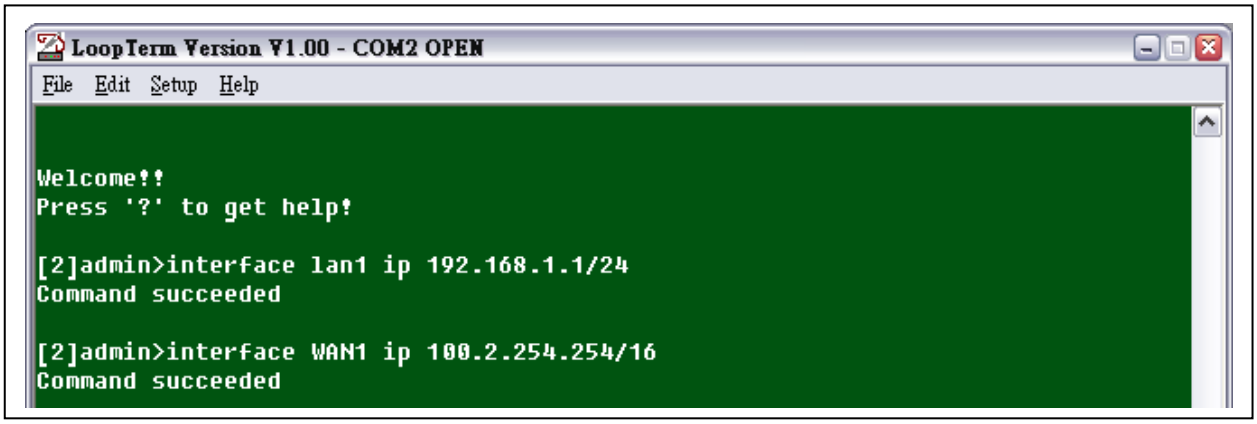


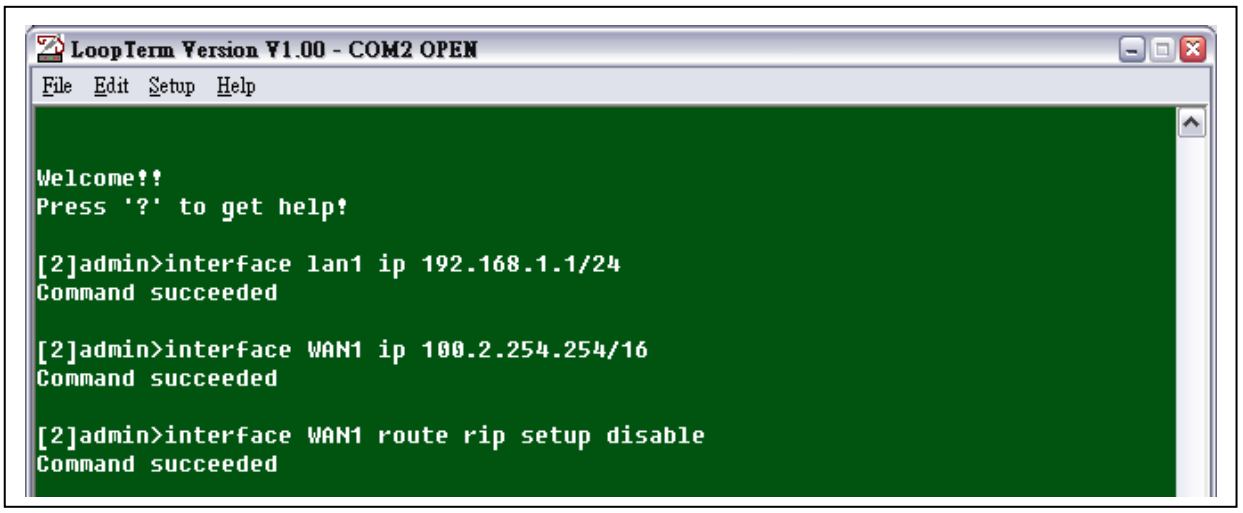
Figure 7- 1 IP Routing Setup

7.2 Step by Step Setup Instructions

Set IP addresses for LAN1 and WAN1.

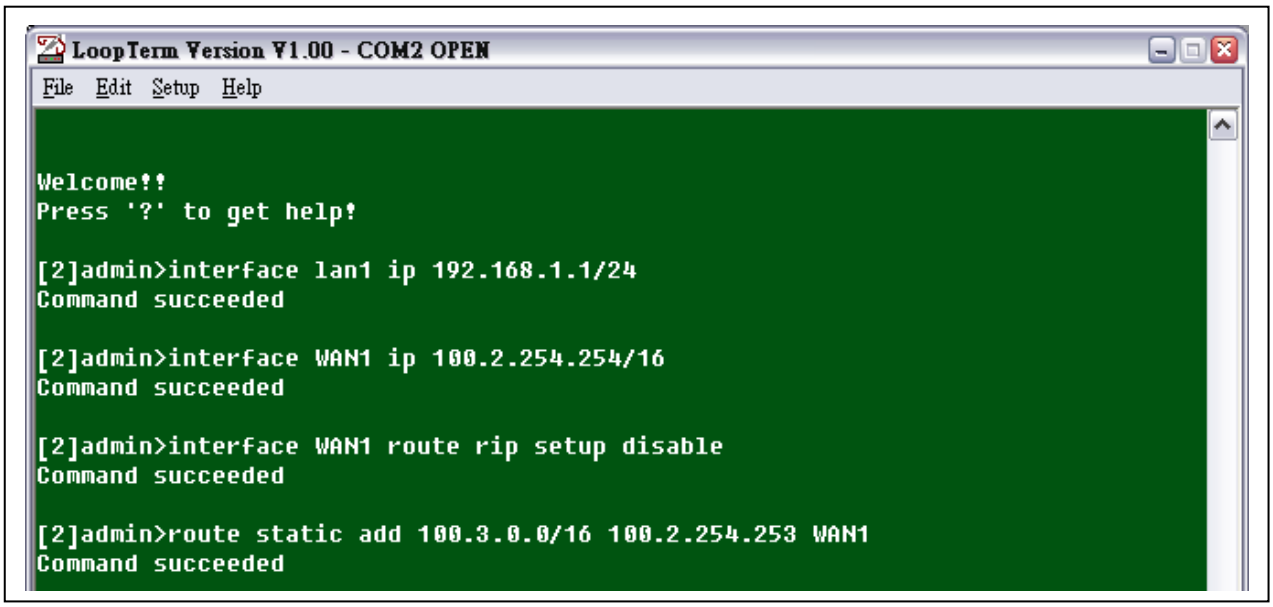


In example, we disable routing protocol. If the RIP 1 or RIP 2 protocol are used, the setup procedure is complete. If RIP protocol is not supported by the peer router, the user must use static routing.



Set a static route for network 100.3.0.0.

Note:
1. the user are able to specify a default route by setting the network address and subnet mask as 0 (eg. **route static add 0.0.0.0/0. 100.2.254.253 WAN1**).
2. max static route number: 64



This setup procedure is now complete.

8 OSPF Setup

8.1 Overview

Figure 8-1 below illustrates the Router-B card being used in router mode. The IP address and gateway address used in the diagram correspond to the sample step by step configuration instructions in Section 8.2.

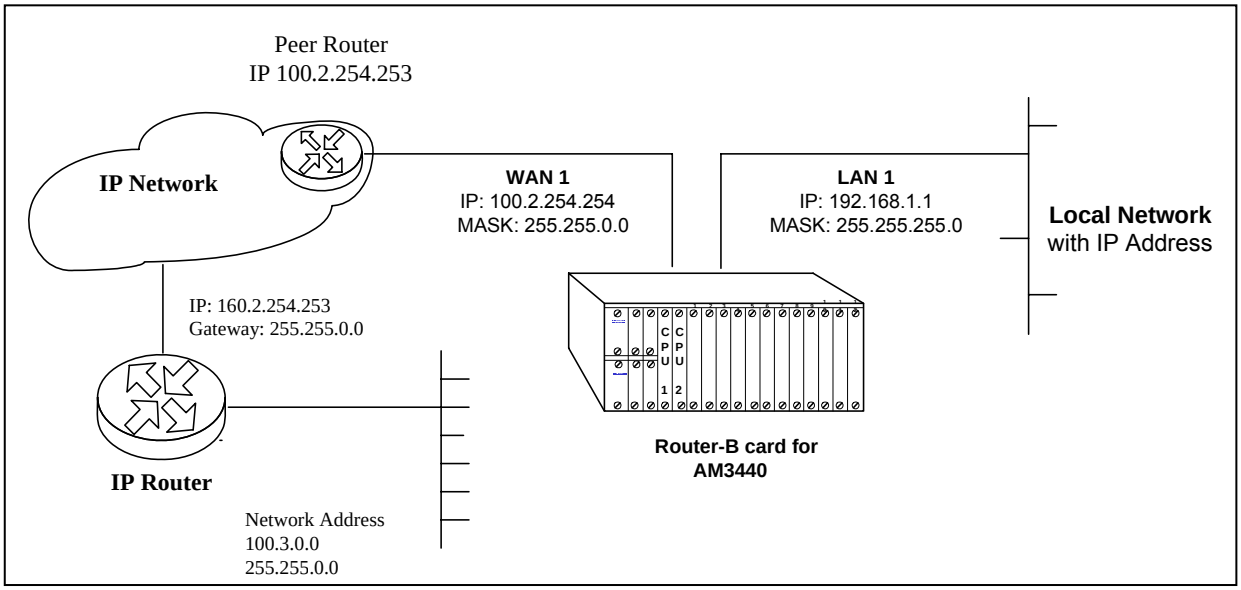


Figure 8- 1 Router Setup (OSPF)

Open Shortest Path First Protocol (OSPFv2)

OSPF is an interior gateway protocol used for routing between routers belonging to a single Autonomous System. OSPF uses link-state technology in which routers send each other information about the direct connections and links which they have to other routers. Each OSPF router maintains an identical database describing the Autonomous System's topology. From this database, a routing table is calculated by constructing a shortest- path tree. OSPF recalculates routes quickly in the face of topological changes, utilizing a minimum of routing protocol traffic. OSPF provides support for equal-cost multi-path. An area routing capability is provided, enabling an additional level of routing protection and a reduction in routing protocol traffic. In addition, all OSPF routing protocol exchanges are authenticated.

OSPF has been designed expressly for the TCP/IP internet environment, including explicit support for CIDR and the tagging of externally-derived routing information. OSPF also provides for the authentication of routing updates, and utilizes IP multicast when sending/receiving the updates.

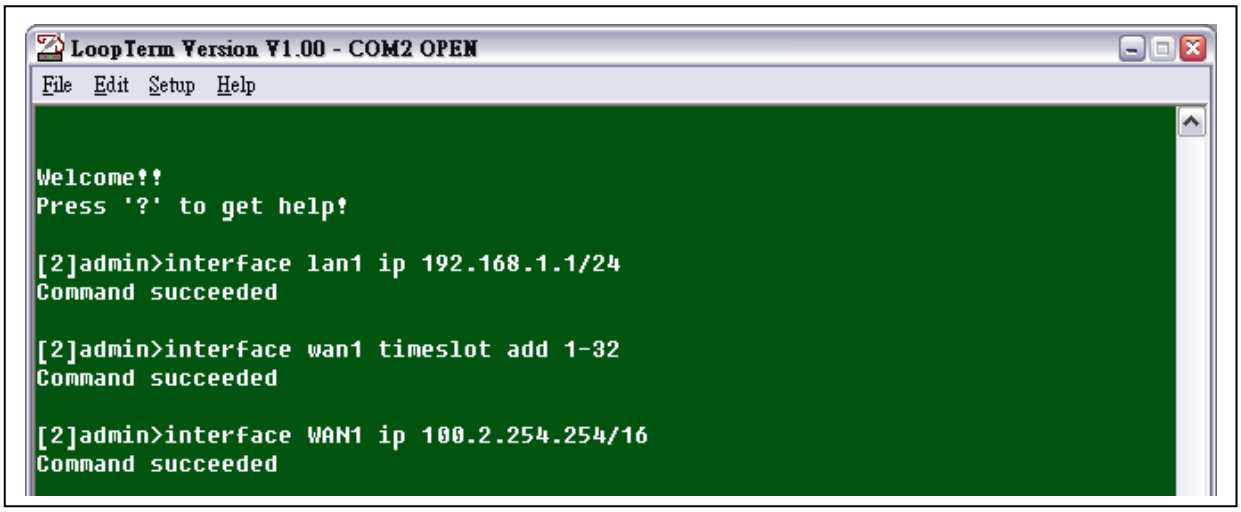
OSPF routes IP packets based solely on the destination IP address found in the IP packet header. IP packets are routed "as is" - they are not encapsulated in any further protocol headers as they transit the Autonomous System.

OSPF allows sets of networks to be grouped together. Such a grouping is called an area. The topology of an area is hidden from the rest of the Autonomous System. This information hiding enables a significant reduction in routing traffic. Also, routing within the area is determined only by the area's own topology, lending the area protection from bad routing data.

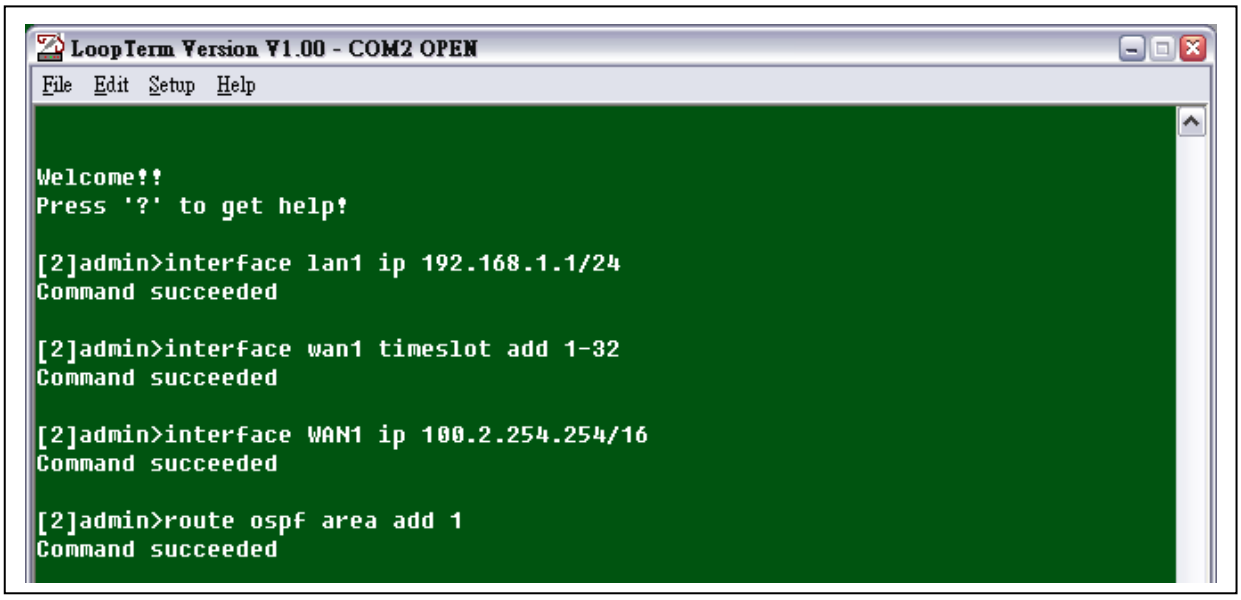
OSPF enables the flexible configuration of IP subnets. Each route distributed by OSPF has a destination and mask. Two different subnets of the same IP network number may have different sizes (i.e., different masks). This is commonly referred to as variable length subnetting. A packet is routed to the best (i.e., longest or most specific) match.

8.2 Step by Step Setup Instructions

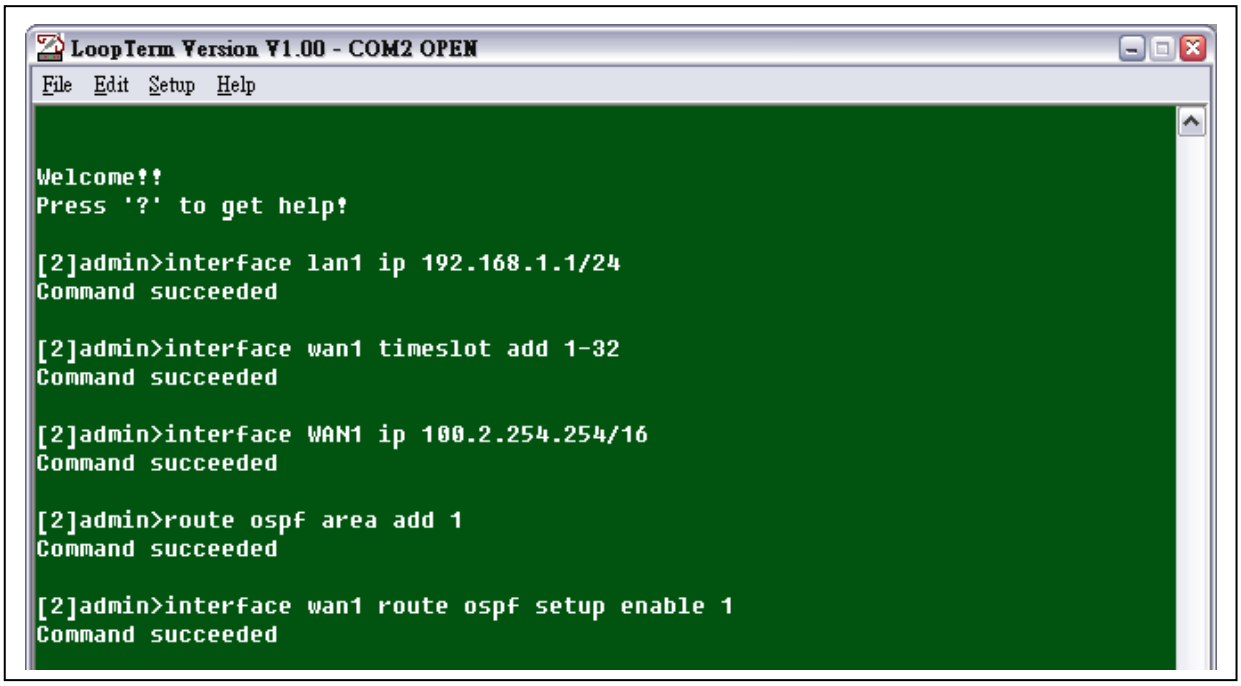
Set IP addresses for LAN1 and WAN1.



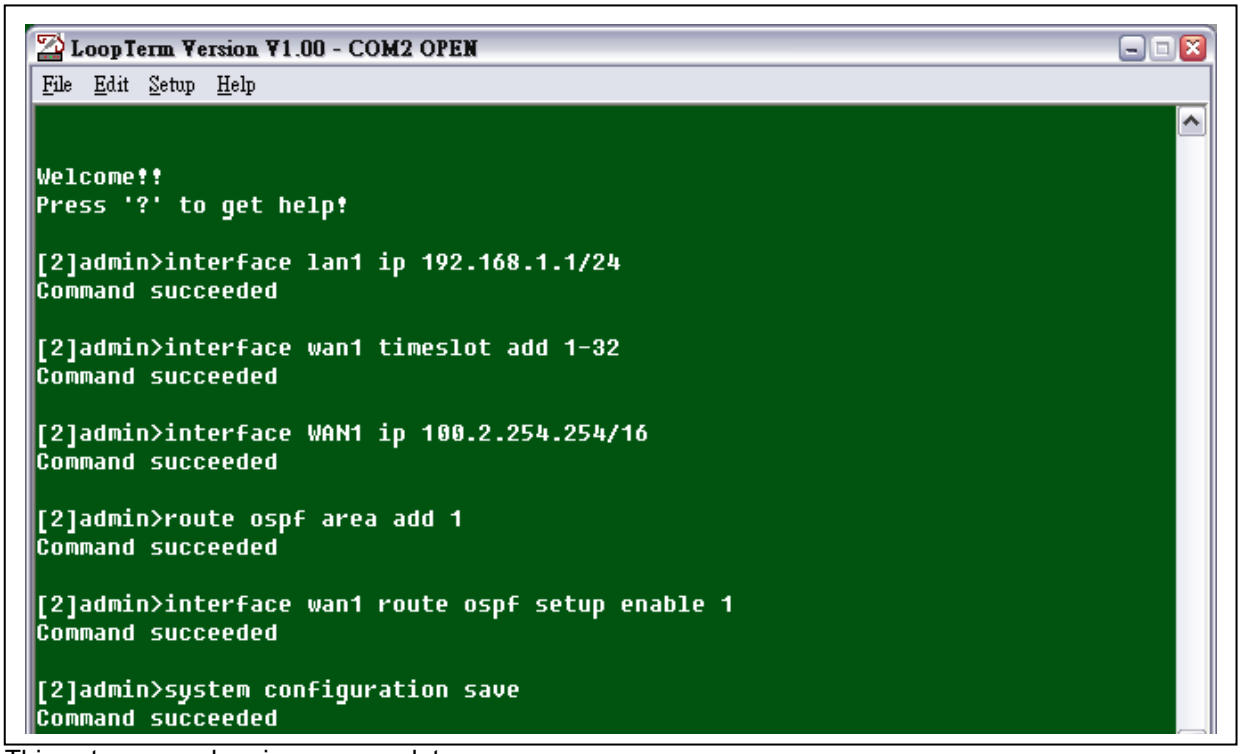
Key in the admin command **route ospf area add 1** to create an area with ID 1.



Set up the WAN1 interface. Key in the admin command **interface wan1 route ospf setup enable 1** to add WAN1 into area 1. Then press the Enter key.



Save the configuration. Key in the command **system configuration save**. Then press the Enter key.



This setup procedure is now complete.

9 DHCP Setup

9.1 DHCP Server overview

DHCP (Dynamic Host Configuration Protocol) can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters (ie. subnet mask and default router), and to provide other configuration information. Figure 9-1, below, illustrates the Router-B card set up in a DHCP server application. All hosts (shown on the right hand side of the network diagram) can get IP addresses from the Router-B card when its DHCP Server is enabled.

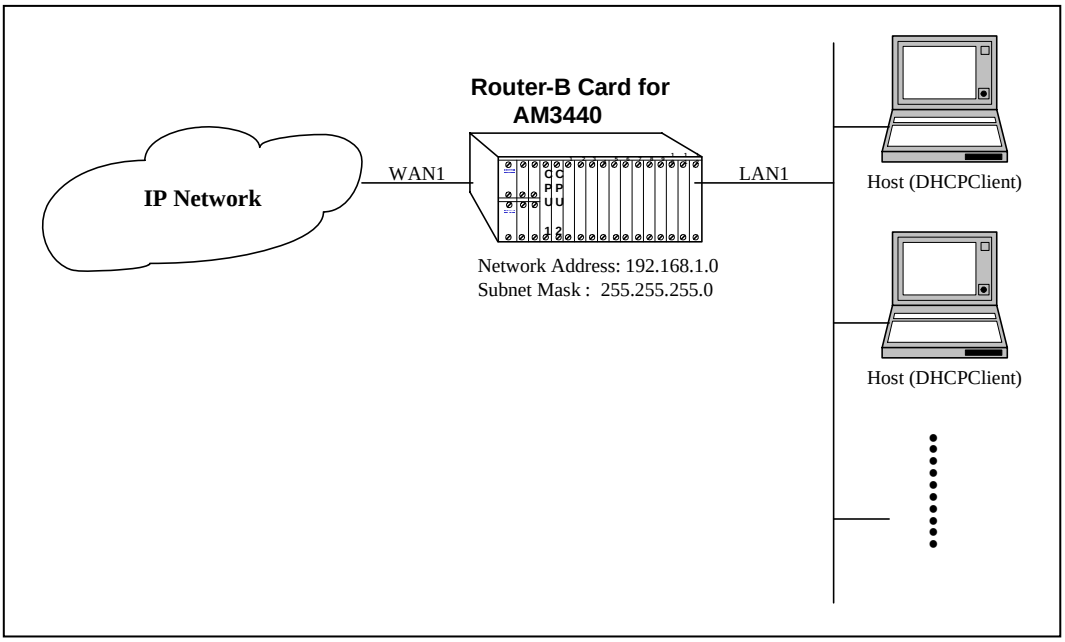
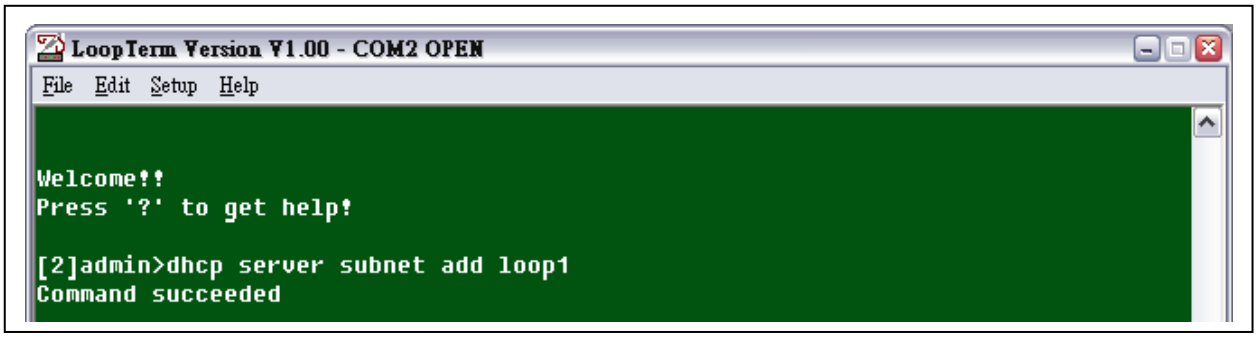


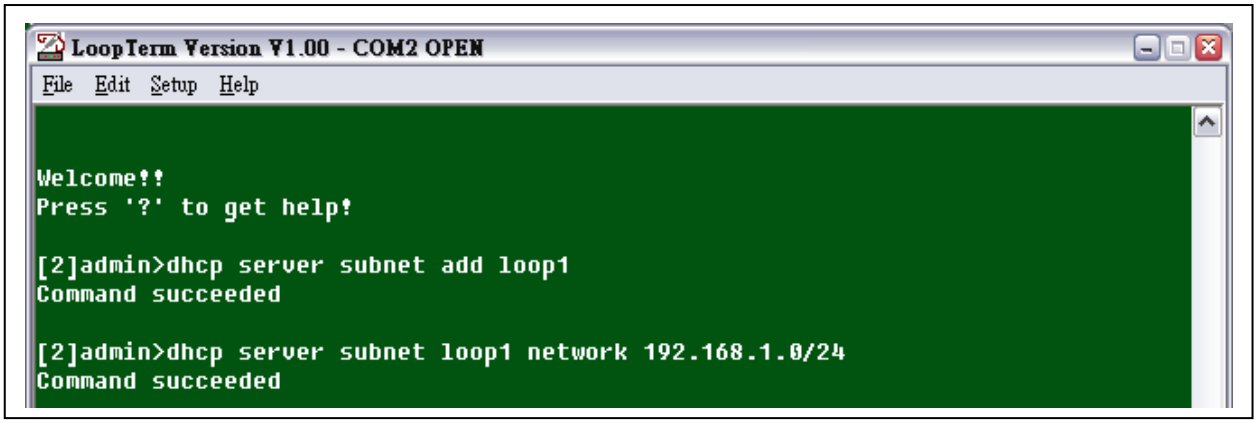
Figure 9- 1 DHCP Application

9.2 DHCP Server Setup

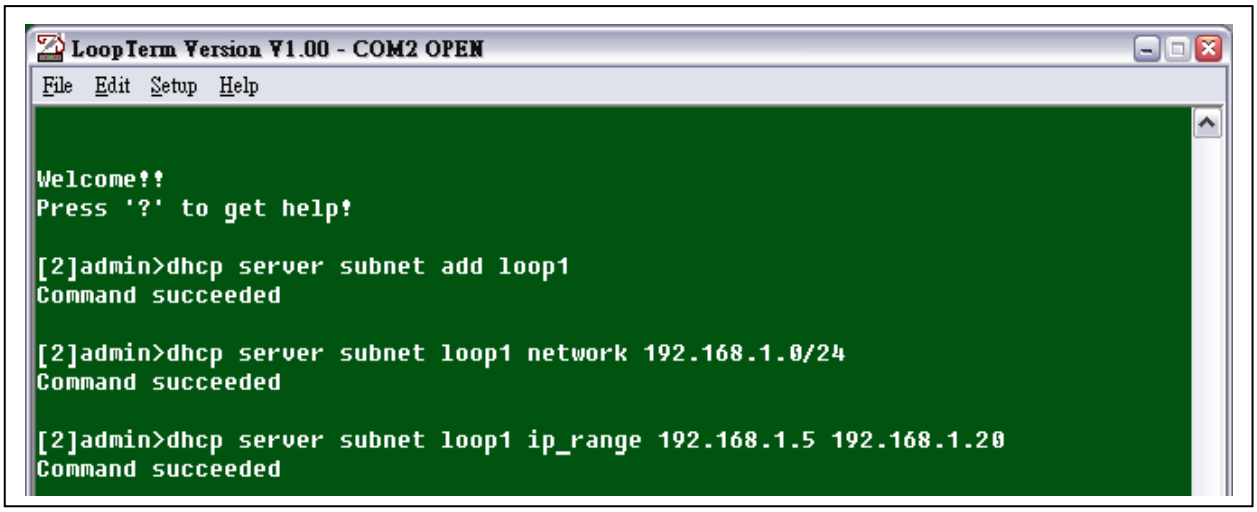
Use the command **dhcp server subnet add** to create a subnet which contains all necessary information needed by DHCP clients. In the following example screen the subnet **loop1** had been created.



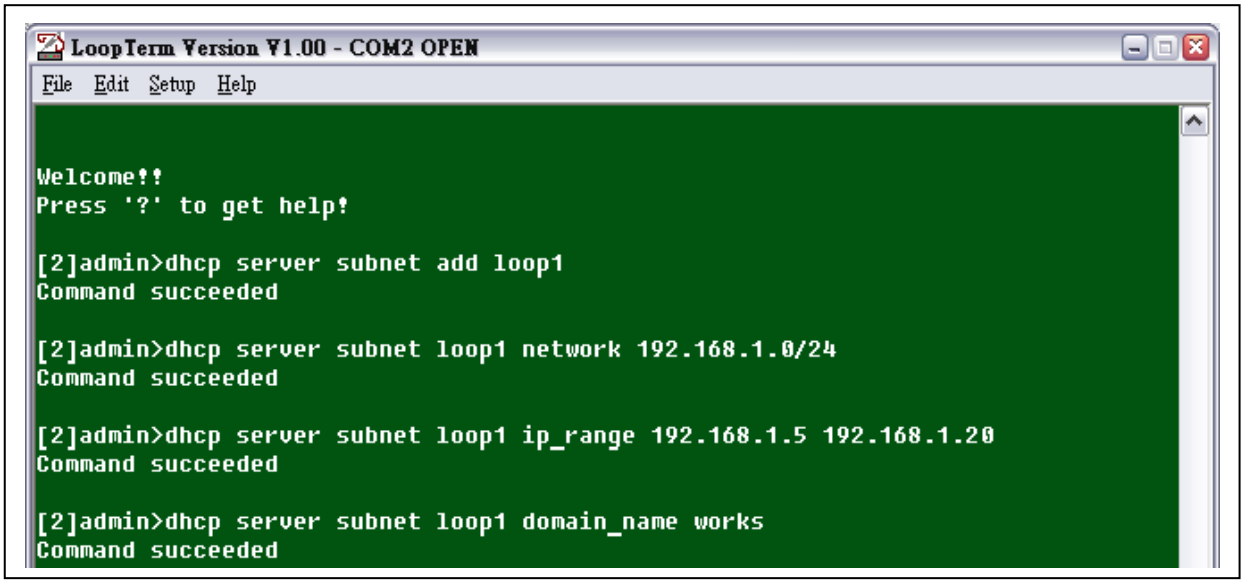
Once a subnet is created, we set network address. When the DHCP server allocate an IP address for a client, the server will also send the client proper network address. The network address is **192.168.1.0/24**.



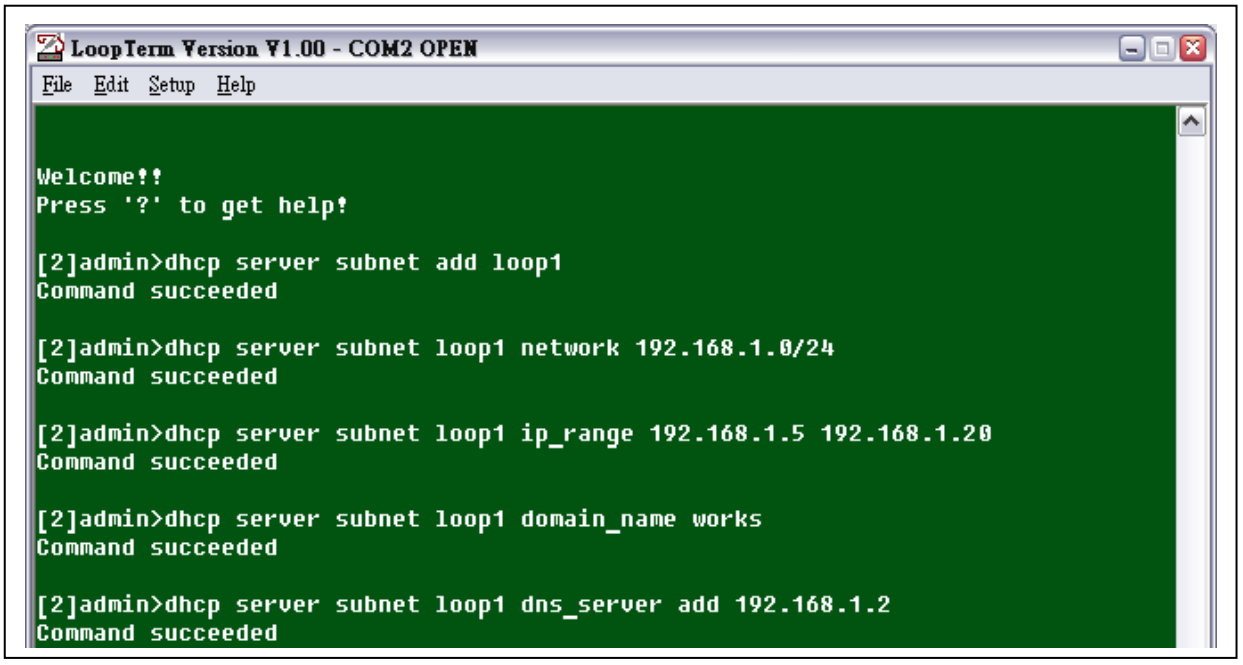
An IP address range from **192.168.1.5 to 192.168.1.20** is for the subnet by key in command **dhcp server subnet loop1 ip_range**.



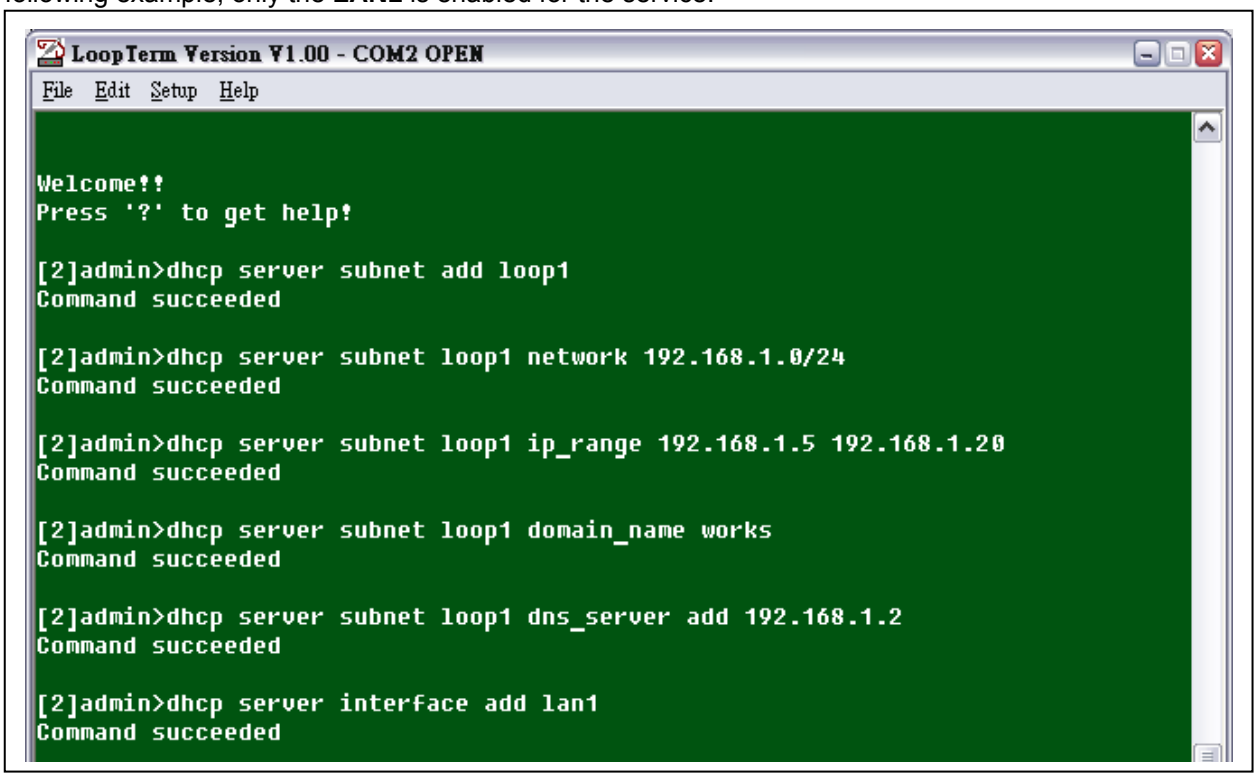
The command **dhcp server subnet domain_name works** set **works** for domain name.



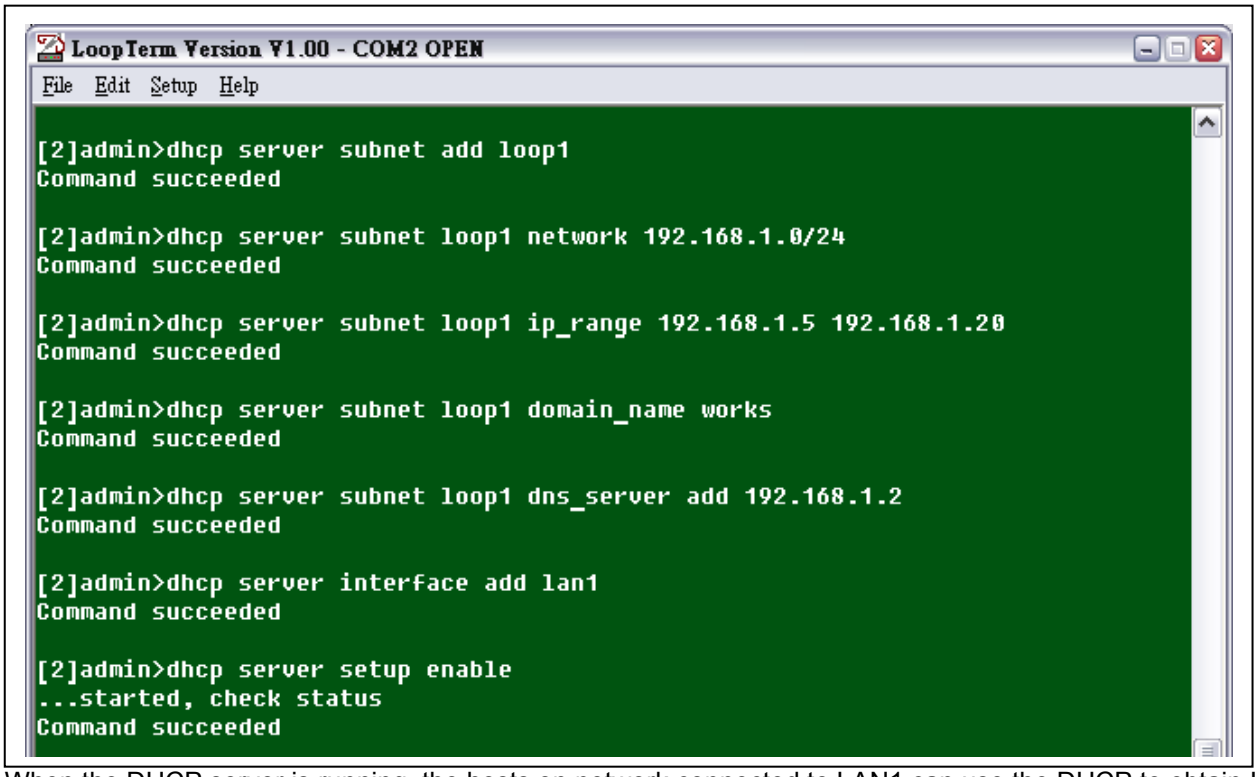
A DNS server **192.168.1.2** is set by command **dhcp server subnet loop1 dns_server add**.



To use command **dhcp server interface add** to add all LAN interfaces which offer DHCP service. As following example, only the **LAN1** is enabled for the service.



The command **dhcp server** enables the DHCP service.



When the DHCP server is running, the hosts on network connected to LAN1 can use the DHCP to obtain IP addresses.

9.3 DHCP Relay Overview

Deploying DHCP in a single subnet network is straightforward. DHCP messages are IP broadcast messages, and all computers on the subnet can listen to and respond to these broadcasts. A single DHCP server is all that is required.

It is complicated when there is more than one subnet on your network. This is because the DHCP broadcast messages do not (by default) cross the router interfaces. The DHCP relay agent allows you to place DHCP clients and DHCP servers on different subnets of your network or even to put them on different networks.

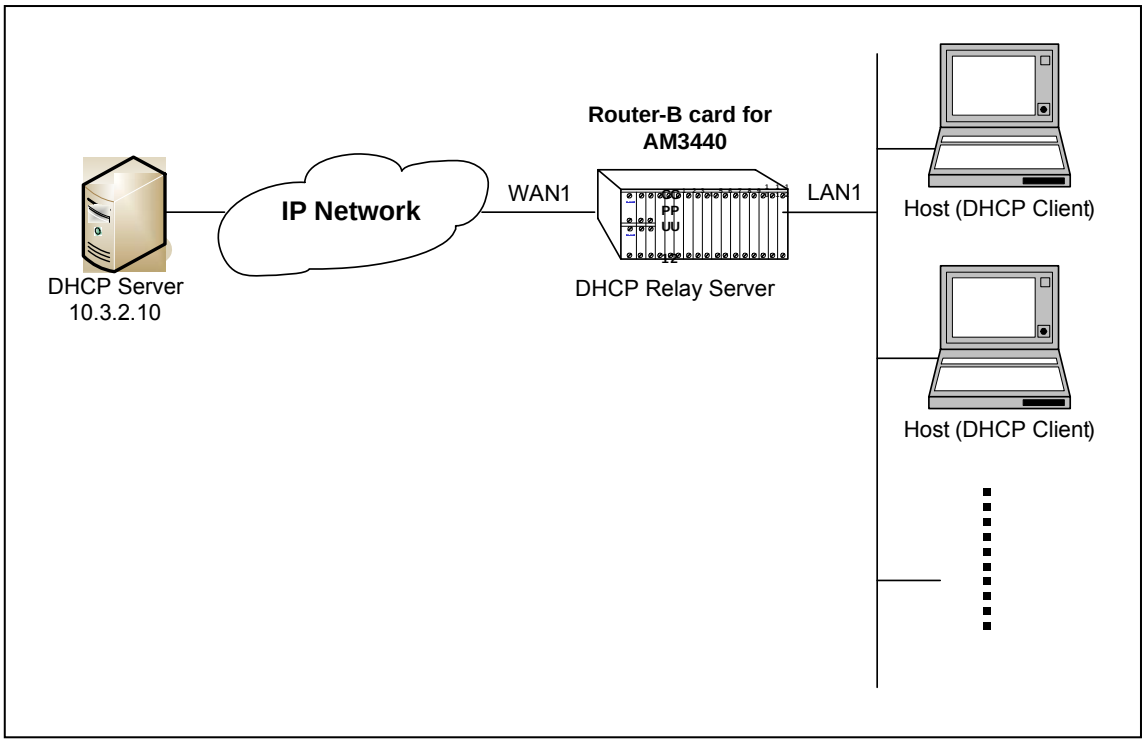
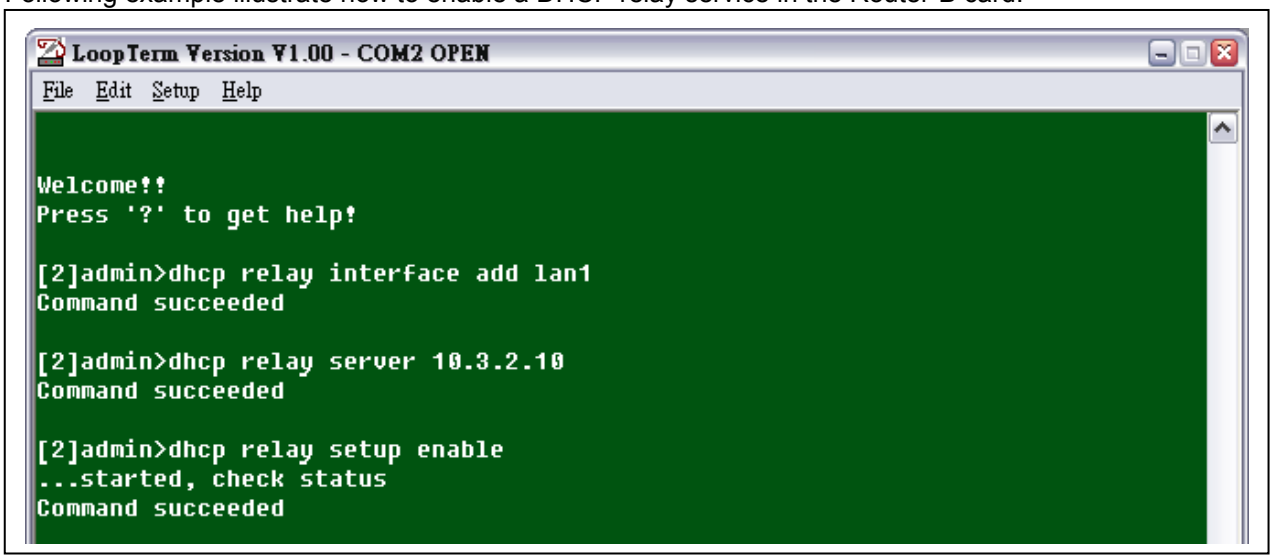


Figure 9- 2 DHCP Relay Setup

9.4 DHCP Relay Setup

Following example illustrate how to enable a DHCP relay service in the Router-B card.



10 Network Address Translation Service

10.1 Overview

The Router-B card Network Address Translation (NAT) service allows IP clients on your local network to access the Internet without requiring you to assign globally unique IP addresses to each system. This feature is used when the user's network only needs to have a few addresses available to access the Internet. In addition, NAT acts as a filter, allowing only certain outbound connections and guaranteeing that inbound connections cannot be initiated from the public network.

This chapter will describe how to setup NAT service to allow clients on your private network to access a public network, such as the Internet.
In Chapter 11 will describe how to setup port fordwarding (virtual service) to allow clients on the public network to access selected resources on your private network.

Figure 10-1 below illustrates the Router-B card being used to provide Network Address Translation services. The IP addresses and gateway addresses used in the diagram correspond to the sample step by step configuration instructions in Section 10.2.

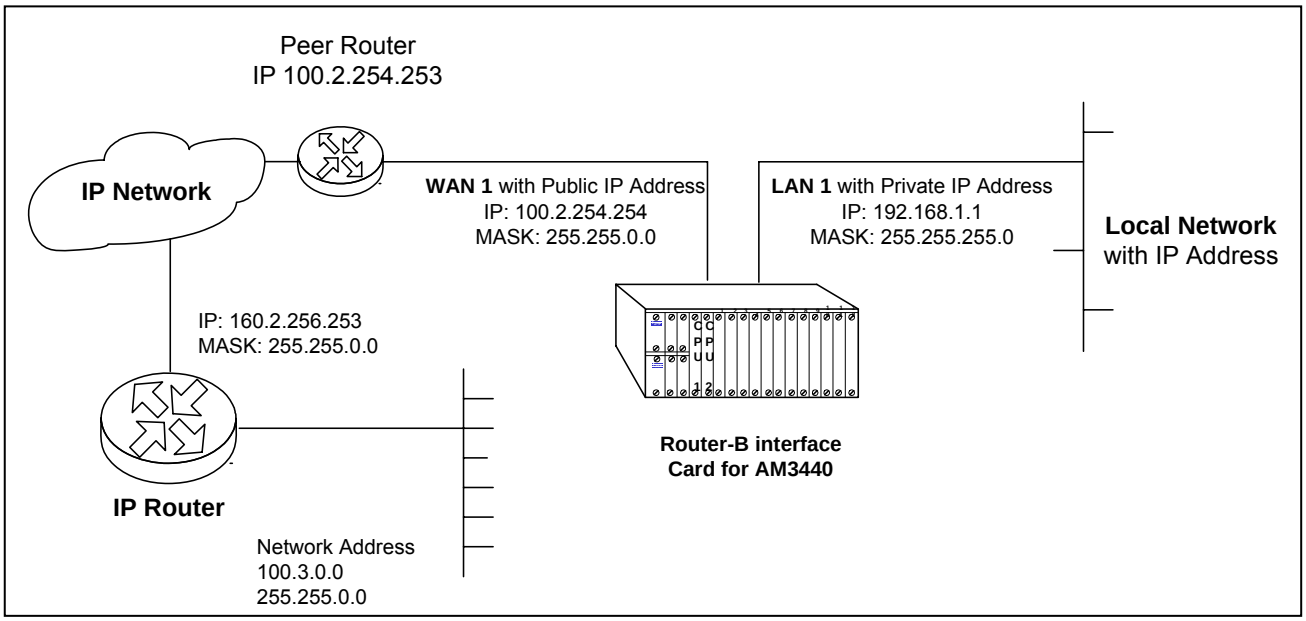


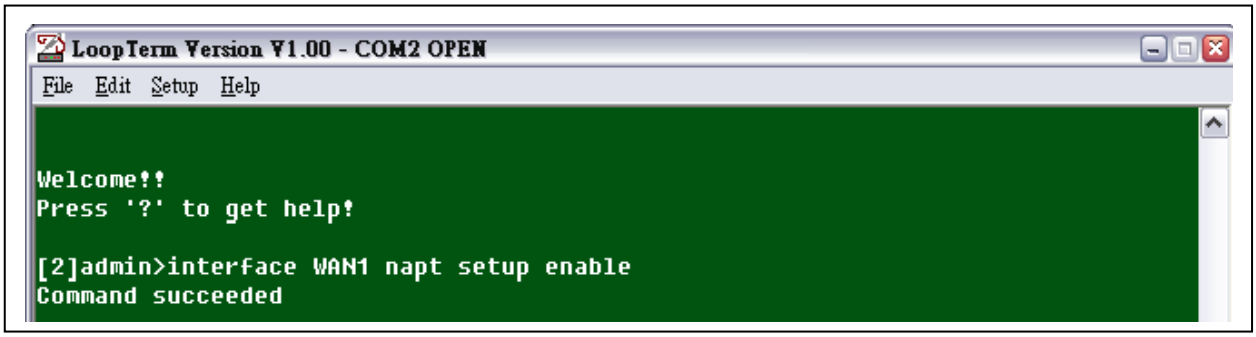
Figure 10- 1 Setting Up IP Routing with Network Address Translation

10.2 Step by Step Setup Instructions

Network address translation service is only available on WAN or PVC interfaces which is in router mode. To implement network address translationservice on Router-B card, the relevant WAN or PVC interface must setup properly in advance.

Note: Key in the command **show interface XXX config** and then press the Enter key to check.

To enable the service, key in the admin command **interface XXX napt setup enable.**



When network translation service is enabled, all routing protocols (including RIP 1 and RIP 2) are automatically disabled. This setup procedure is now complete.

11 Port Forwarding - Virtual Service

11.1 Overview

When NAPT is enabled, the user is able to set up a static port forwarding table in the Loop Router-B card that instructs the Router-B card to forward specific service packets to specified internal servers. Figure 11-1 below, illlustrates a HTTP and FTP server put into an intranet by a Loop Router-B with a Port Forwarding Table. The Router-B card allows users on the public network (left-hand side of the drawing) to access the HTTP and FTP Server on the right-hand side of the drawing.

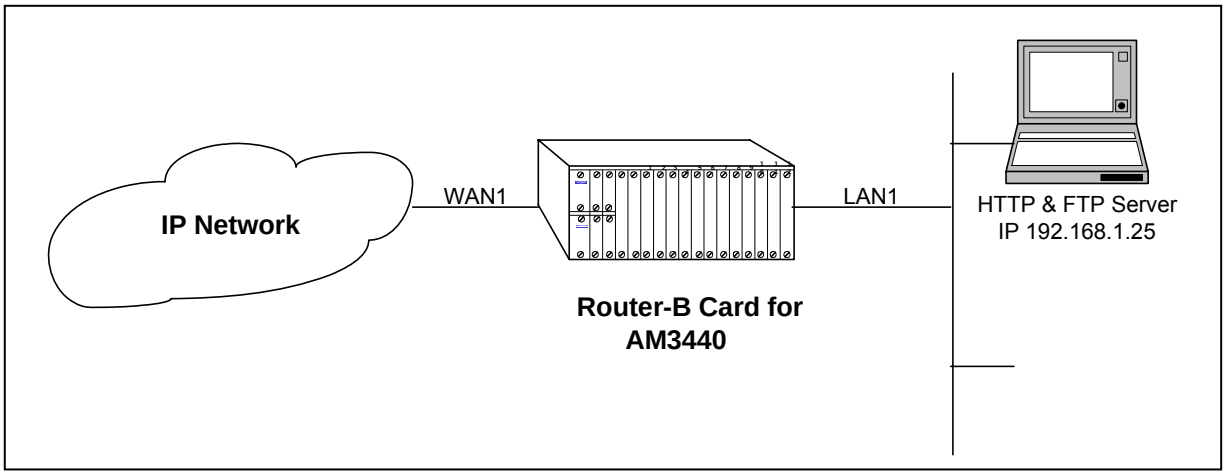
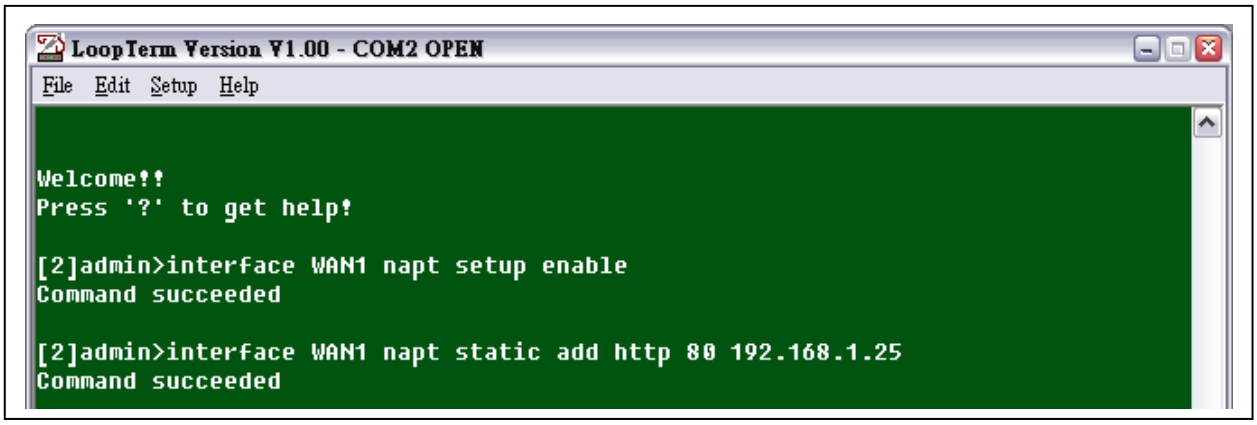


Figure 11- 1 Port Forwarding - Virtual Service Application

11.2 Step by Step Setup Instructions

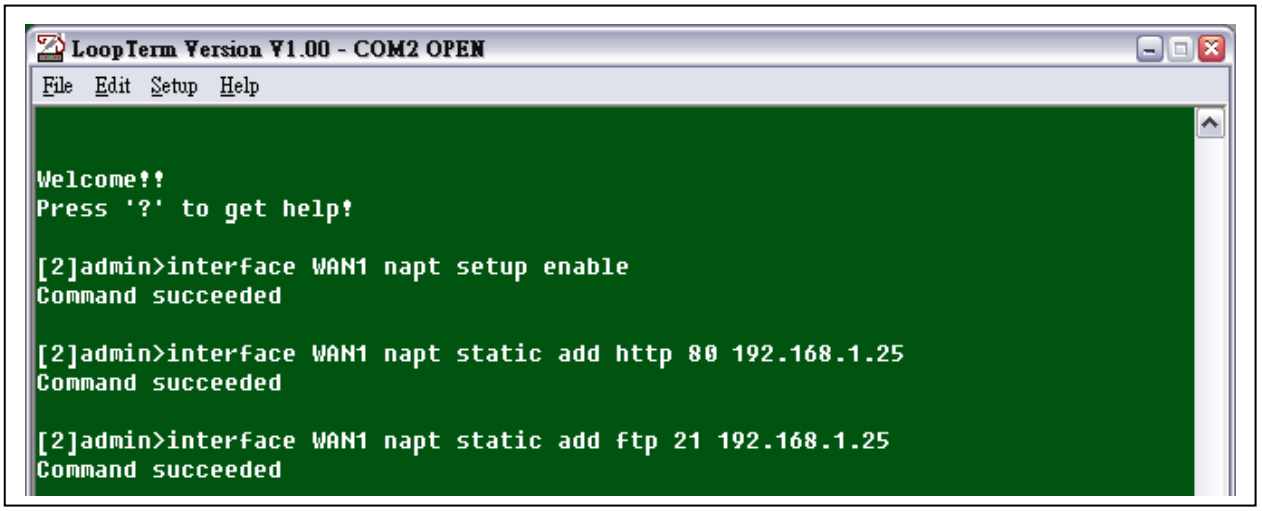
To enable port forwrding service, NAPT must be enabled in the WAN or PVC interface in advance.

The user have to establish where http packets forwarded. Key in the command **interface WAN1 napt static add http** followed by the port number and the http server ip address. Then press the Enter key. In the sample screen below the packets are forwarded to port **80,** then key in the IP address **192.168.1.25** for http

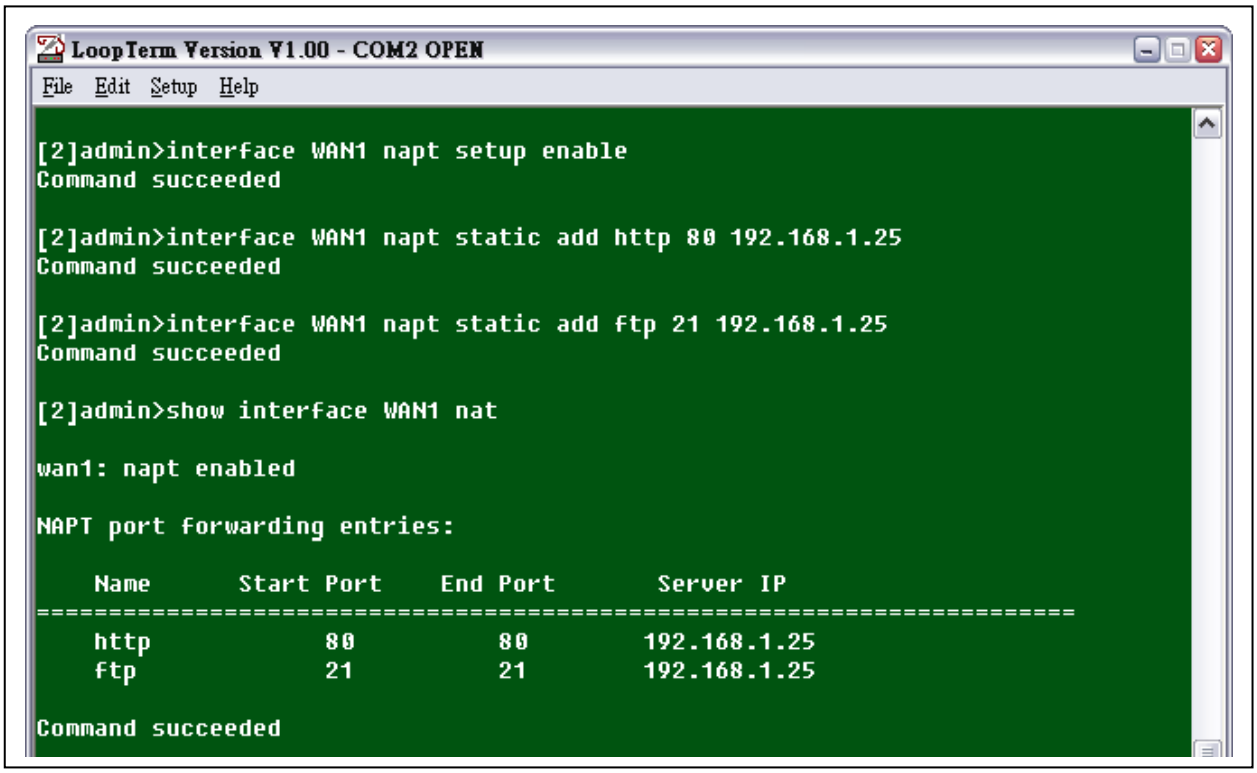


server.

The user have to establish where ftp packets forwarded. Key in the command **interface WAN1 napt static add ftp** followed by the port number and the ftp server ip address. Then press the Enter key. In the sample screen below the packets are forwarded to port **21**, then key in the IP address **192.168.1.25** of our ftp server.



To view the results of setup, key in the command **show interface WAN1 nat**. The setup configuration will be displayed as the screen below.



12 Traffic Filtering Setup

12.1 Overview

The Router-B card provides basic traffic filtering capabilities, such as access control lists (ACL). Traffic filtering is the process of deciding the disposition of each packet that can possibly pass through a router with the access control lists. With this feature, Router-B card provides the basic protection mechanism for a routing firewall host, allowing the user to determine what traffic passes through it based upon the contents of the packet, thereby potentially limiting access to each of the networks controlled by the lists.

The access control lists are a group of entries. Each entry defines a pattern that would be found in an IP packet and associates an action with the packets. As each packet comes through an interface with an associated access list, the list is scanned from top to bottom for a pattern that matches the incoming packet. A permit or deny rule associated with the pattern determines that packet's disposition. The user can also use a mask, which is like a wild card, to determine how much of an IP source or destination address to apply to the pattern match. The pattern statement also include a TCP or UDP destination port number.

Also, keep in mind that once you associate the list with an interface, any packet not matched by the list is dropped by default.

12.2 Policy ACL Syntax

12.2.1 Policy create

policy acl create [list_name]

To define an access control list, user first needs to create the list by a unique name. Each ACL policy list is referenced by this name. Once the list is created, user can add the new entry into the list by “policy acl <list-name> append” command to define new packet filtering rule.

12.2.2 Policy add

policy acl <list-name> append [action] [selector]

Defines the packet filtering rule; instructs the new entry to add at the tail of the list defined by the name <list-name>

<list-name> Name of the ACL policy list which is created above, each policy list has unique name.

action Each statement’s parameter is started with the **action** field; specify packets matching the criteria should permit or deny. This decides the disposition of the packet matching the pattern definition described by **selector.**

selector Packet matching criteria, the **selector** sets some matching condition. If the packet matches the condition, then the packet will be applied an action according to the parameters specified by **action**. Format of the selector is as following:

"[src_ip/prefix] [dst_ip/prefix] [protocol] [service]"

- **src_ip/prefix** The source network address that are interested by the policy. The parameter will be matched with source address field of IP packets. With prefix, you can indicate a host or a network to match. Key in ‘any’ if you do not want to filter the source address.
- **dst_ip/prefix** The interested destination network address. The parameter will be matched with destination address field of IP packets. With prefix, you can indicate a host or a network to match. Key in ‘any’ if you do not want to filter the destination address.
- **protocol** Interested protocol type carried by an IP packet. If you are interested on filtering only on IP addresses, this field can be ignored. Otherwise if you are trying to filter TCP, UDP or ICMP packets, specify the appropriate name of protocol.
- **service** If protocol is TCP or UDP, you can mention the specific destination port number carried by an IP packet for filtering; otherwise this field has no meaning. You can mention destination port number in minimum-maximum format for a range of port number or ‘any’ if you are not interested for a particular destination port number.

12.2.3 Policy delete

policy acl <list-name> delete [start_index] [end_index]

Instructs the policy to be deleted. Each policy is indexed by the policy number in the ACL policy list, user should mention the policy number which one to be removed.

<list-name>	unique name of the ACL policy list.
start_index	Start index of the policy list. If end_index is not mentioned, only one policy with index “start_index” will be removed from the list.
end_index	Optional end index; if mentioned, all entries between start and end index will be removed from the list**.**

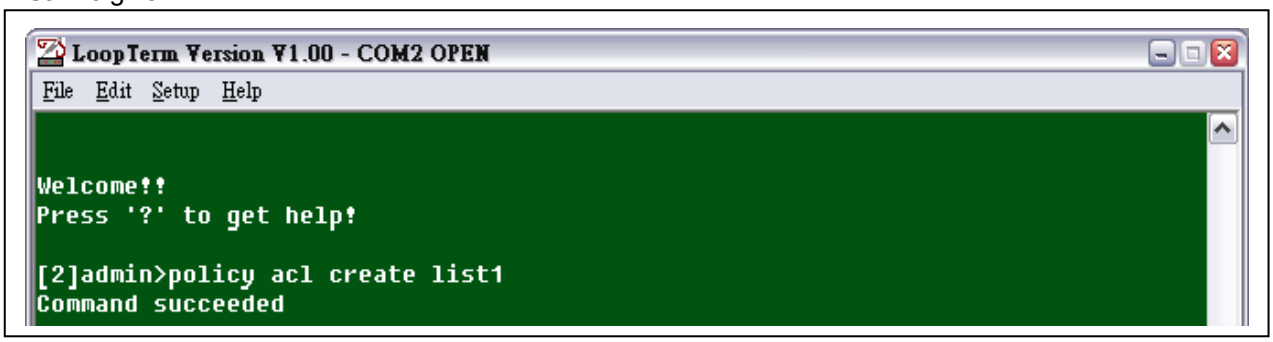
12.2.4 Policy display

show policy <list-name>

Display all the filtering rules defined in the ACL list named “list-name”

12.3 Adding ACL entries

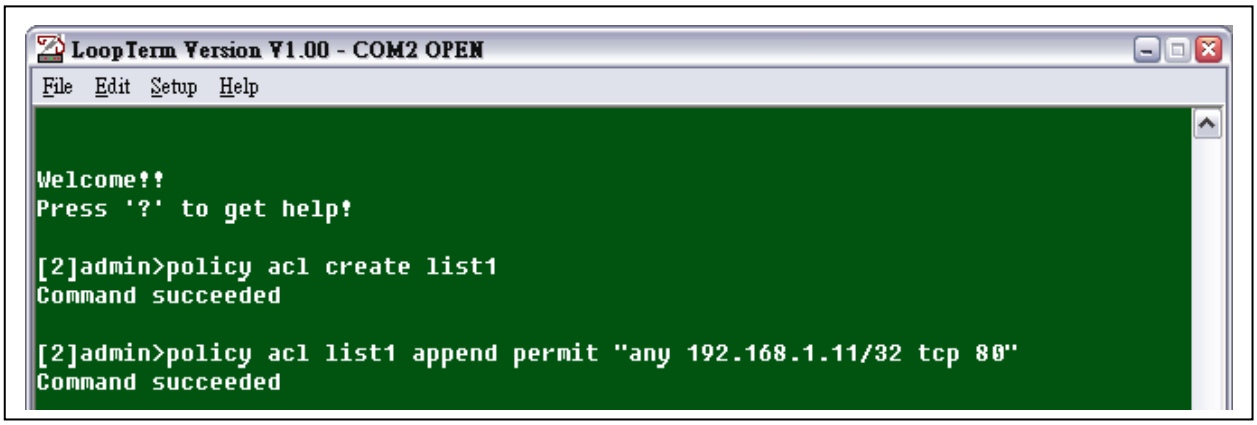
Before adding any ACL entry, an ACL list must be created first. Key in the command **policy acl create** followed by the name you WANt to gice. Then press the Enter key. In the following example, the list name "**list1**" is given.



After creating the control list, ACL entris are able to be appended.

A screen with a flashing cursor will appear. Key in the command **policy acl list-1 append** followed by the packet source IP address plus its subnet mask prefix length, the packet destination IP address (ie. your HTTP server) plus its subnet mask prefix length, and finally the number of the port where the packet will be received. Press the Enter key.

In our sample screen below we keyed in **any** as the source address, **192.168.1.11/32** as the destination HTTP IP address, **32** as the destinatrion address subnet mask prefix length, and **80** as the port number.



12.4 Step by Step Setup Instructions

In section12.2, an example is given to illustrates how to filter out unWANted traffic and permit certain traffic in this situation. The IP addresses and gateway addresses used in the Figure 12-1 correspond to the sample step by step configuration instructions.

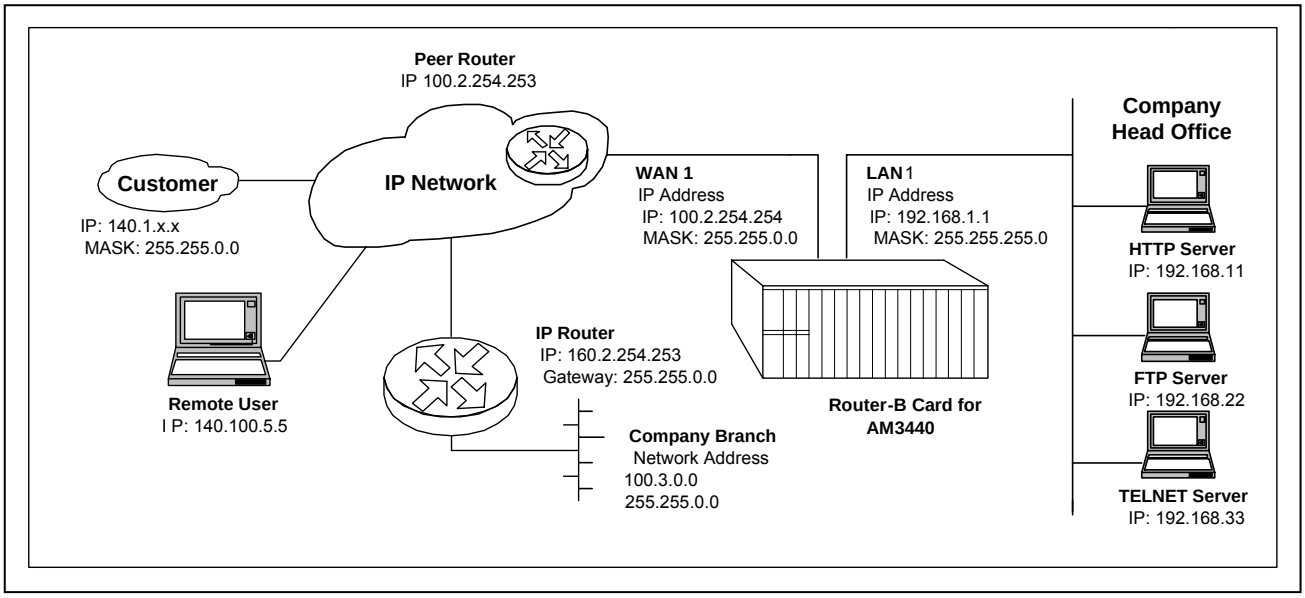


Figure 12- 1 Traffic Filtering Example Network

Before configuring the access control lists, you need to setup relevent interfaces in router mode.
In Figure 12-1, three servers are located in the local network. Their IP addresses are as follows:
HTTP Server: 192.168.11
FTP Server: 192.168.22
TELNET Server: 192.168.33

Note: This is a sample setup only. Your setup will have IP addresses relevant to your own situation.

Our goal in this example is to protect your local network behind the LAN1 interface but still privide some traffic to access certain servers in the local network. More specifically, the following statements are given to illustrates our security requirement.

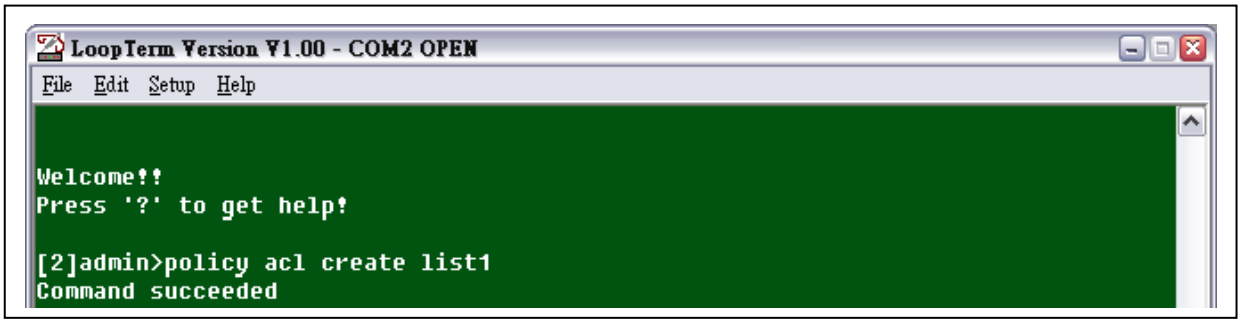
1. The HTTP server is accessible by all PCs (also known as hosts) in the network, no matter from internet or local network.

2. TELNET Server access (IP: 192.168.100.33) is available **only** to the designated Remote User (IP: 140.100.5.5). No other devices, including those at thecompany head office (Network: 192.168.1.0) or branch office (Network: 100.3.0.0), can reach that server.

3. IP: 100.3.0.0 is the network for company branch office, so all traffic from that site is permitted to access PCs in company head office (Network: 192.168.1.0) except the TELNET server, which is only available to designated Remote User (IP: 140.100.5.5), as desbribed above.

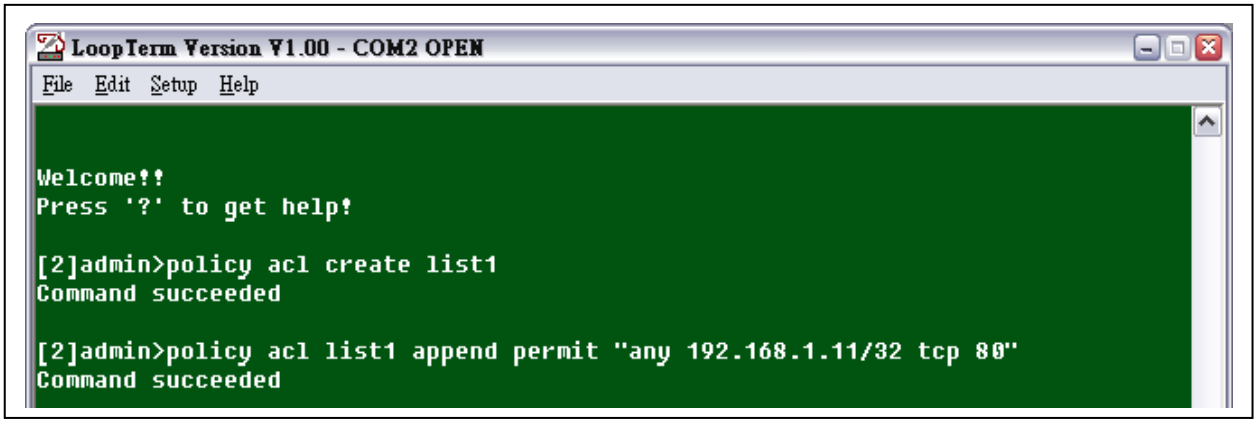
4. Because TFTP Server Access is provided **only** for the custmer site (Network: 140.1.0.0) and the company branch office(Network: 100.3.0.0), the Router-B card shall permit TFTP packets from those sites.

Before adding any ACL entry, an ACL list must be created first. Key in the command **policy acl create** followed by the name you WANt to give. Then press the Enter key. In the following example, the list name "**list1**" is given.

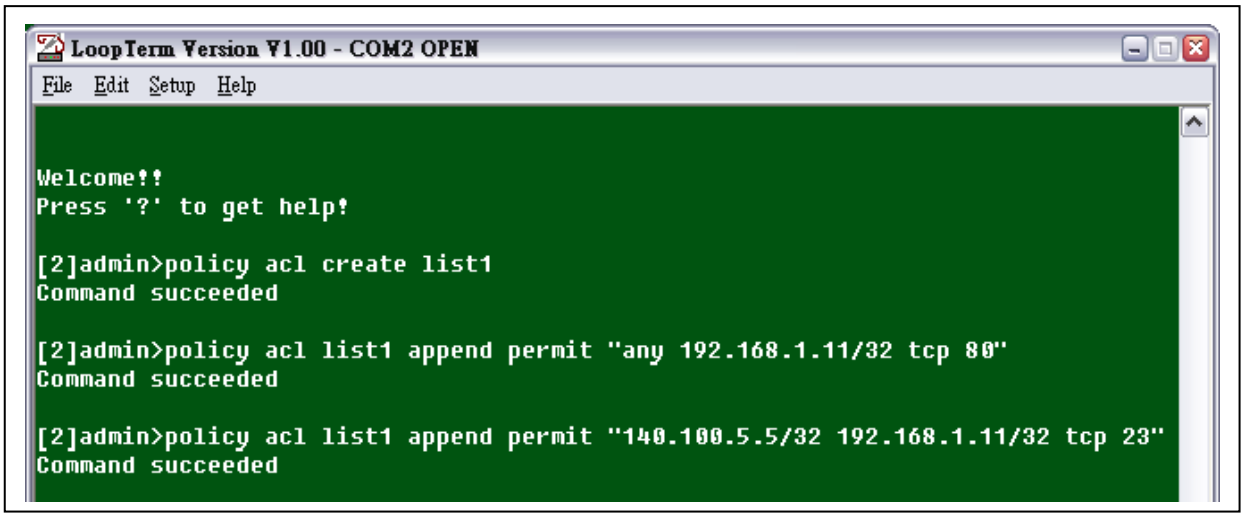


After creating the control list, ACL entries are able to be appended. Press the Enter key.

In the example entry shows below, any TCP packets with port number **80** is permitted to access the HTTP server, i.e. the HTTP session to HTTP server is allowed.

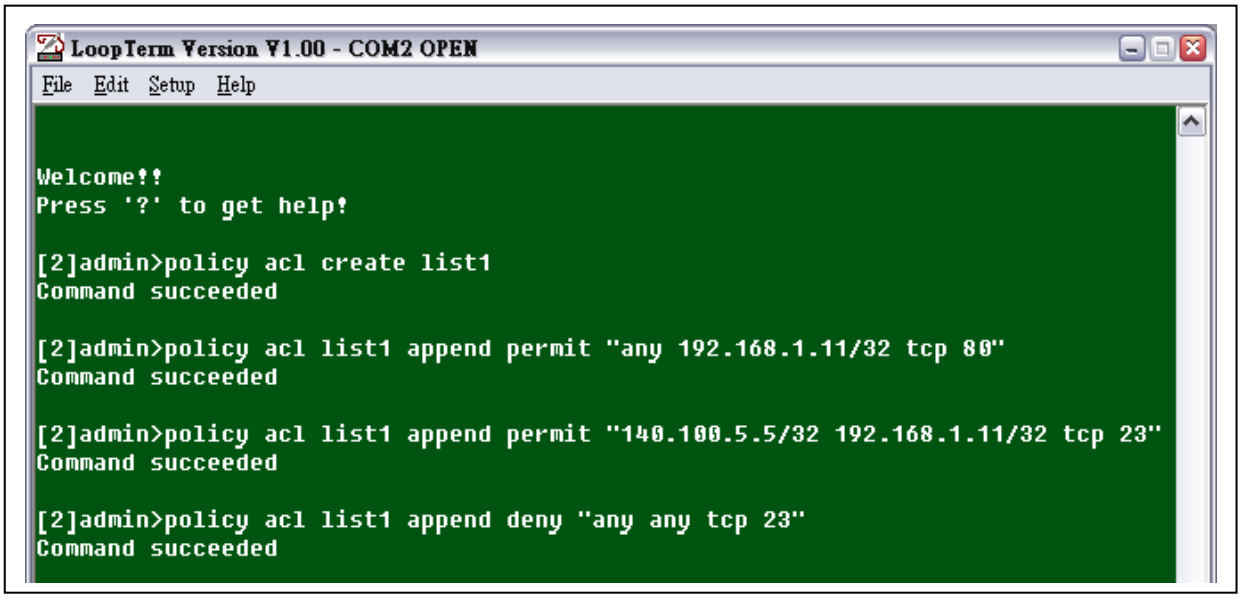


In the example entry shows below, packets with source IP address **140.100.5.5**, destination IP address **192.168.1.11**, TCP port number **23** is permitted, i.e. the TELNET session requests from 140.100.5.5 to 192.168.1.11 are allowed.



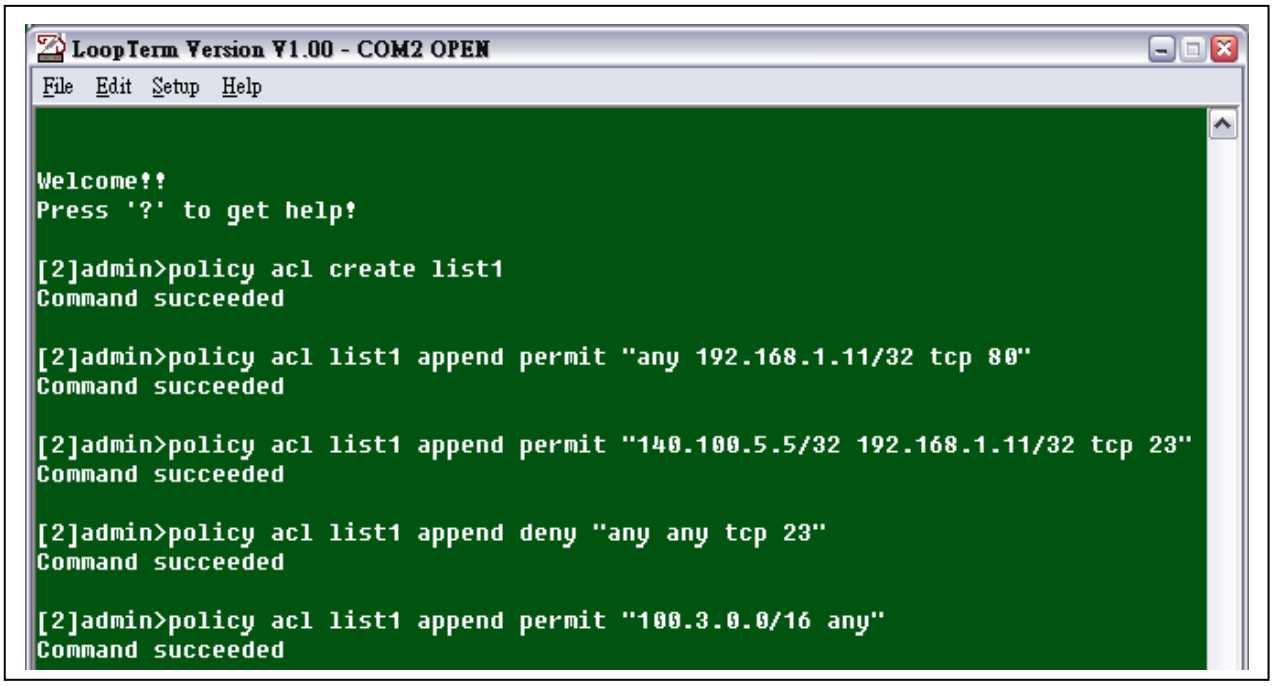
In the following example, one more entry is appended to the access control list **list1**. That entry denies all TCP packets with port number 23, i.e. the TELNET session is prohibitted to any location on the company network.

Combining the last two entrise, this access list accepts only the TELNET session from 140.100.5.5 to 192.168.1.11 and drops all other TELNET session currently, which meets the 2nd security request.

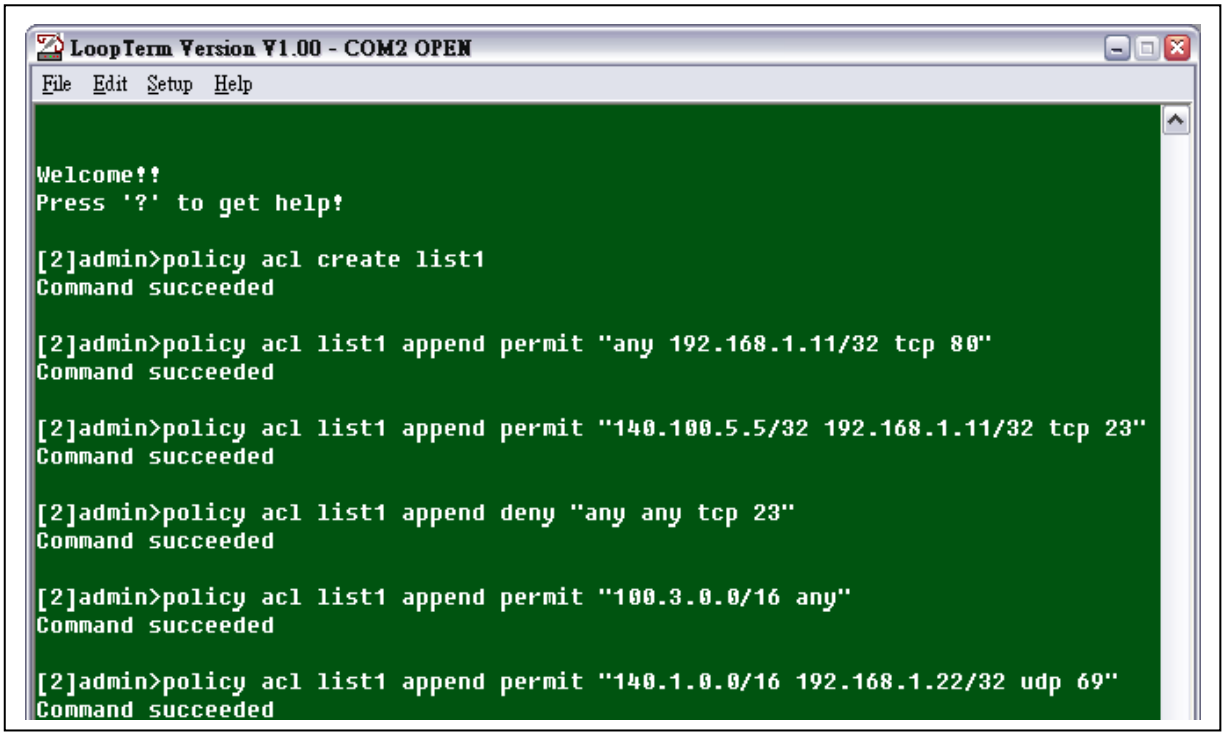


Key in the command **policy ac1 list1 append** followed by the permit action, the selector specified the packet source IP address and binary code subnet mask with the branch office network to meet the 3rd security request.

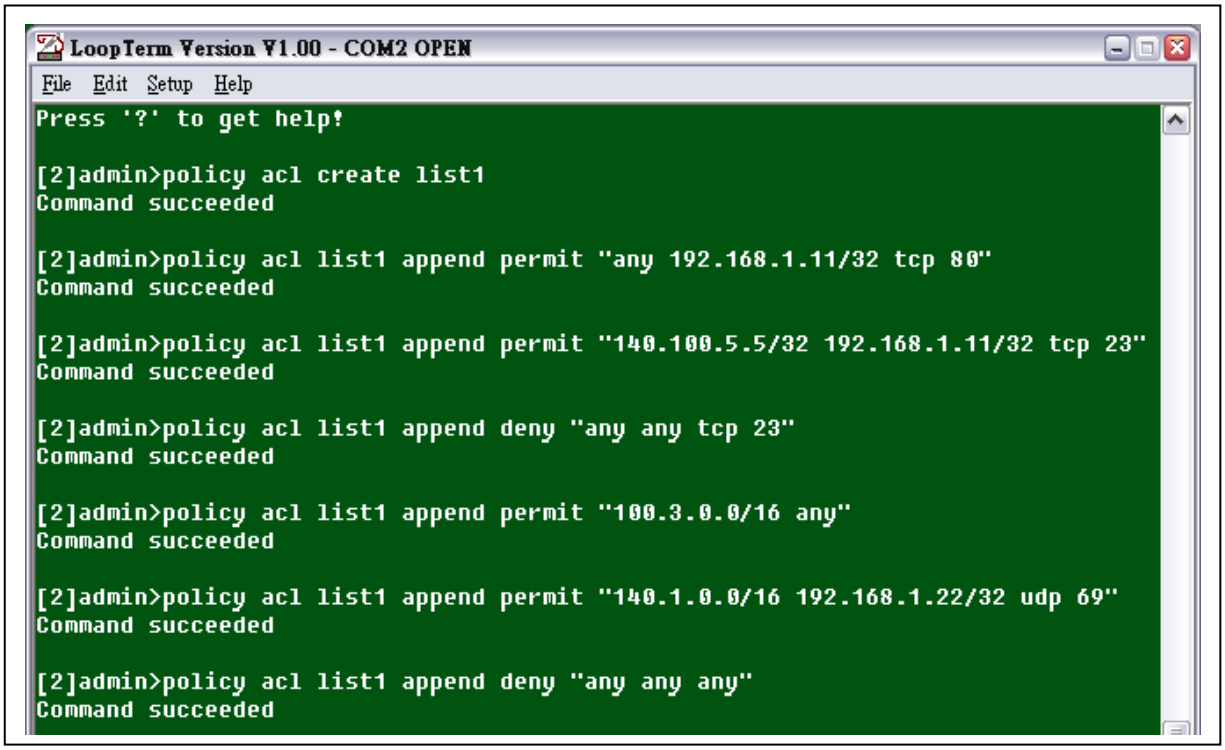
The entries are scanned from top to bottom when packets passing through the Router-B card.
The following command will allow any packets from a branch office to pass through to head office. However, TELNET sessions are prohibited because the command above is appended.



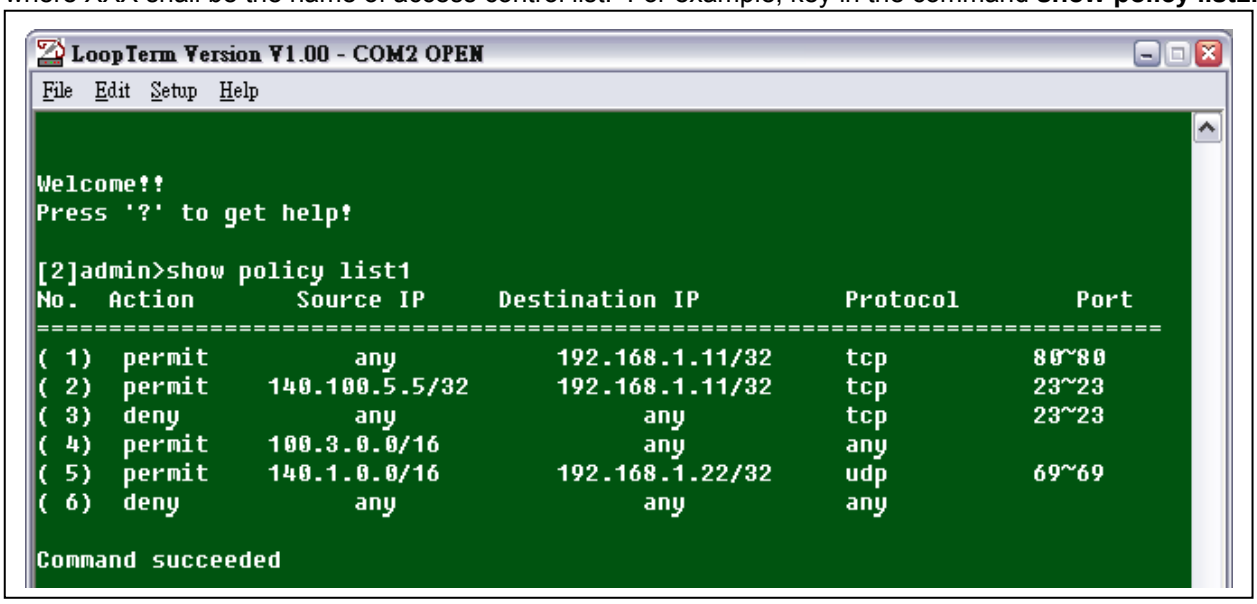
In the following example, one more entry is appended to the access control list **list1**.That entry allows **UDP** packets with source address **140.1.0.0/16**, destination address **192.168.1.22/32** and port number **69**, i.e. the TFTP sessions from custmer site are allowed to access the company branch office.



The final command, shown below, can be omitted. If a packet cannot match any rules, the packet will be dropped.

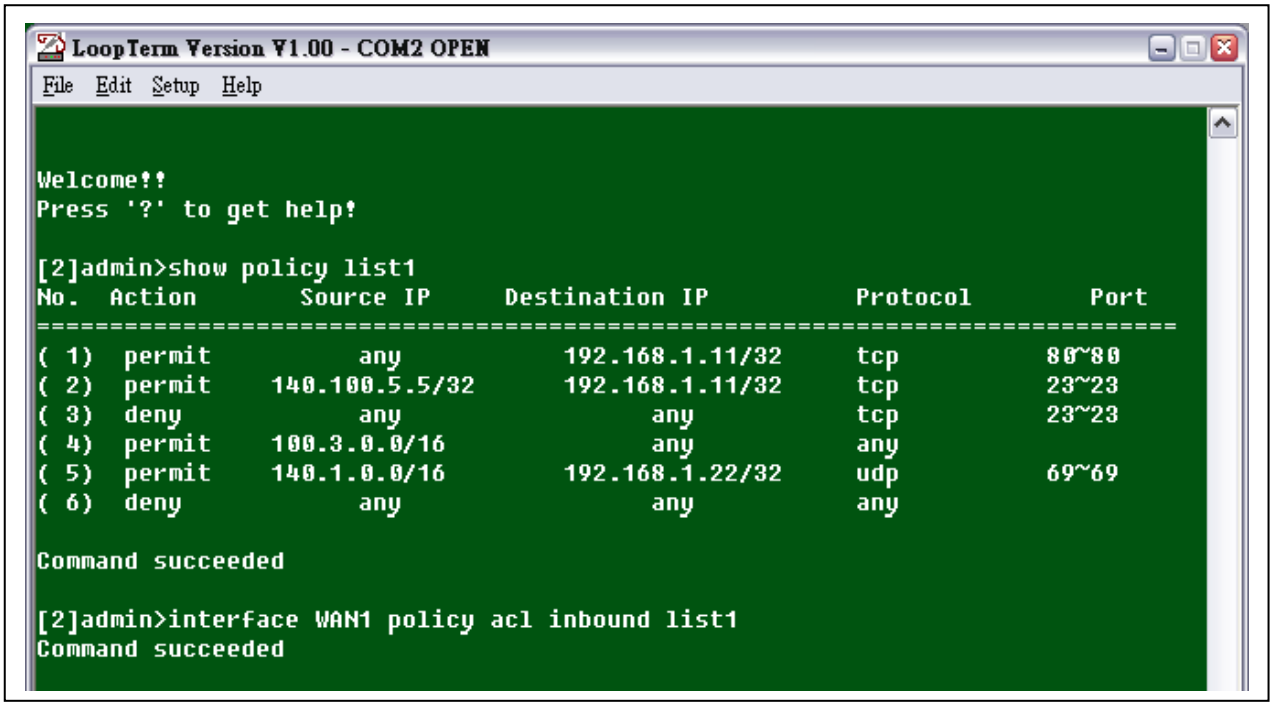


In case of checking the rule entries in the control list, the user can key in the command **show policy XXX**, where XXX shall be the name of access control list. For example, key in the command **show policy list1.**



The access list will be active when it is associated with a port or interface. The ACL can be applied to incoming or outgoing packets on the interface.

Key in the command **interface XXX policy acl inbound/outbound YYY**, where XXX is the interface name and YYY is the access list name. For exmaple, key in the command where XXX is **WAN1** and YYY is **list1**.



13 QoS Setup

13.1 Overview

In packet networks, one important requirement for link sharing is to share bandwidth on a link between multiple agencies, where each agency wants to receive a guaranteed share of the link bandwidth during congestion. But where bandwidth that is not being used by one agency should be available to other agencies sharing the link. Quality of Service (QoS) is the idea that transmission rates, error rates can be measured, improved, and to some extent guaranteed in advance. QoS enables you to provide better service to certain flows and helps user to control the use of the outbound traffic on a given link. Router-B QoS is policy based where the traffic type defines each policy. In AM3440, we have classified the outgoing traffic (i.e. policy) by packet's IP address, network protocol and/or TCP/UDP port number. User can configure the committed bandwidth for a particular class of traffic by mentioning the minimum and maximum bandwidth. Make sure total configured bandwidth of all such policy must not exceed the link's physical bandwidth.

Note: QoS is supported for WAN interface only and it supports maximum 32 WAN interfaces at a time.

13.2 Policy Syntax

13.2.1 Policy add

interface wan1~64 policy qos rate_limit append/insert [policy_num] selector action_parameter

append/insert Instructs where to put the newly created policy entry. If **append** is specified, the new entry is put at the tail of the policy list. If **insert** is specified, the new entry is put before the policy number specified by **policy_num**.

policy-num When the policy is inserted into the list, **policy_num** specifies insert point of the new policy entry, for append user should not skip this parameter.

selector Outgoing packet match criteria, the **selector** sets some matching condition. If the packet going through the interface matches the condition, then the packet will be applied an action according to the parameters specified by **action-parameter**. Format of the selector is as following:

src_ip dest_ip protocol [src_port] [dst_port] [dscp]

src_ip The source network address that are interested by the policy. The parameter will be matched with source address field of IP packets.

dst_ip The interested destination network address. The parameter will be matched with destination address field of IP packets.

protocol Interested protocol type carried by an IP packet. The field can be a decimal value or a protocol name, like TCP or UDP.

src_port If protocol is TCP or UDP, user can mention the specific source port number carried by an IP packet. User can specify a range of source port or 'any' if he/she is not interested for a particular source port number.

dst_port Interested destination port number for an IP packet if protocol is TCP or UDP. User can mention destination port number in minimum-maximum format for a range of port number or 'any' if he/she is not interested for a particular destination port number. Both source/destination port number is a decimal value (1~65535)

	dscp	Diffrentiated Services Code Point (DSCP) is an integer value encoded in the DS field of an IP header. The DSCP is an example of traffic marking because its value corresponds with a prefred QoS as the packet traverses the network. The DSCP value corresponds to a specific QoS. The six most significant bits of the DiffServ field is called as the DSCP, which is basically the six most significant bits of TOS byte in IP header. So DSCP value range is 0-63.
action_parameter	**action_parameter** controls the outgoing traffic flow rate for IP packet matched the policy criteria specified by **selector.**	
	rate	Committed access rate in minimum-maximum format. The minimum rate is guaranteed the minimum rate of the selected policy. When the maximum_rate is mentioned in the **action-parameter**, the parameter is specified the maximum rate of the selected policy. If maximum_rate is not mentioned, it is used that maximum rate is same as minimum rate.
	type	Unit of rate in kbps or mbps, specify the unit of bandwidth in bits per sec.

13.2.2 Policy delete

interface wan1~64 policy qos rate_limit delete [policy_num]

Instruct the policy to be deleted. Each policy is indexed by the policy number in the policy list, user should mention the policy number which one to be removed.

13.2.3 Policy display

show interface wan1~64 policy qos

This CLI is used to display all policies user ever entered for a particular interface, shows all policy in the policy list sequentially according to the policy number.

13.3 Step by Step Setup Instructions

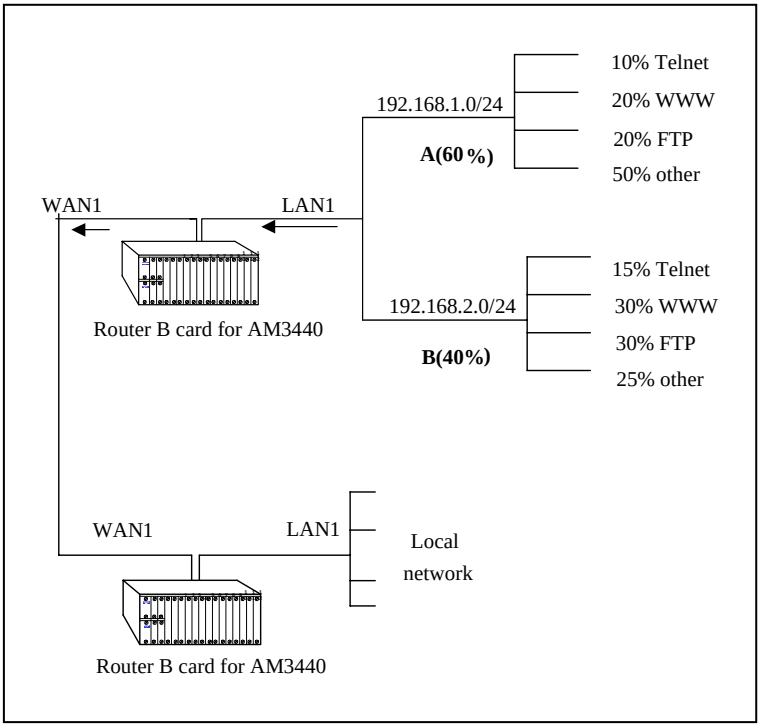


Figure 13- 1 QoS Application

Two subnetworks, A and B are accessed through the WAN1 interface of our ROUTER-B card as depicted in the figure i.e. all traffics of these networks are passed through WAN1 interface. Again each of A and B have different types of traffic, say Telnet, WWW, FTP or so on. Suppose Telnet of subnet A has high traffic rate and consume most of the bandwidth of WAN1, other will be blocked, as WAN1 don't have enough bandwidth compared to LAN1 and eventually some traffic from LAN1 will be dropped. To solve this problem, Policy rate limit is installed on WAN1 to control bandwidth distribution. Suppose subnet A will have 60% of the available WAN1 bandwidth guarnteed; subnetwork B the rest (40%). Within each subnetwork the guarantee flows for each type of service are as is indicated in the figure. Assume WAN1 has 1Mbps bandwidth, so telnet in subnet A will have 60 Kbps (10% of 60% of 1Mbps) guaranteed bandwidth, while FTP will have 120 Kbps. Corresponding commands for these Telnet and FTP for subnet A are as follows:

1. interface WAN1 policy qos rate_limit append 192.168.1.0/24 any TCP 23 any 60-60 kbps
2. interface WAN1 policy qos rate_limit append 192.168.1.0/24 any TCP 21 any 120 kbps

For other 2 class of traffic in subnet A, type following commands:

1. interface WAN1 policy qos rate_limit append 192.168.1.0/24 any any 80 any 120-120 kbps (for www)
2. interface WAN1 policy qos rate_limit append 192.168.1.0/24 any any 300 kbps (for other)

Following are the commands to setup traffic distribution control for subnet B:

1. interface WAN1 policy qos rate_limit append 192.168.2.0/24 any TCP 23 any 60 kbps (for telnet)
2. interface WAN1 policy qos rate_limit append 192.168.2.0/24 any TCP 21 any 120-120 kbps (for ftp)
3. interface WAN1 policy qos rate_limit append 192.168.2.0/24 any any 80 120 kbps (for www)
4. interface WAN1 policy qos rate_limit append 192.168.2.0/24 any any 100-100 kbps (for other)

14 Remote Bridge Setup Overview

Figure 14-1 below illustrates the Router-B card being used in bridge mode. There are two AM3440s with Router-B cards in this application. Their setup procedures are identical. The IP addresses and gateway addresses used in the diagram correspond to the sample step by step configuration instructions in section 14.1.

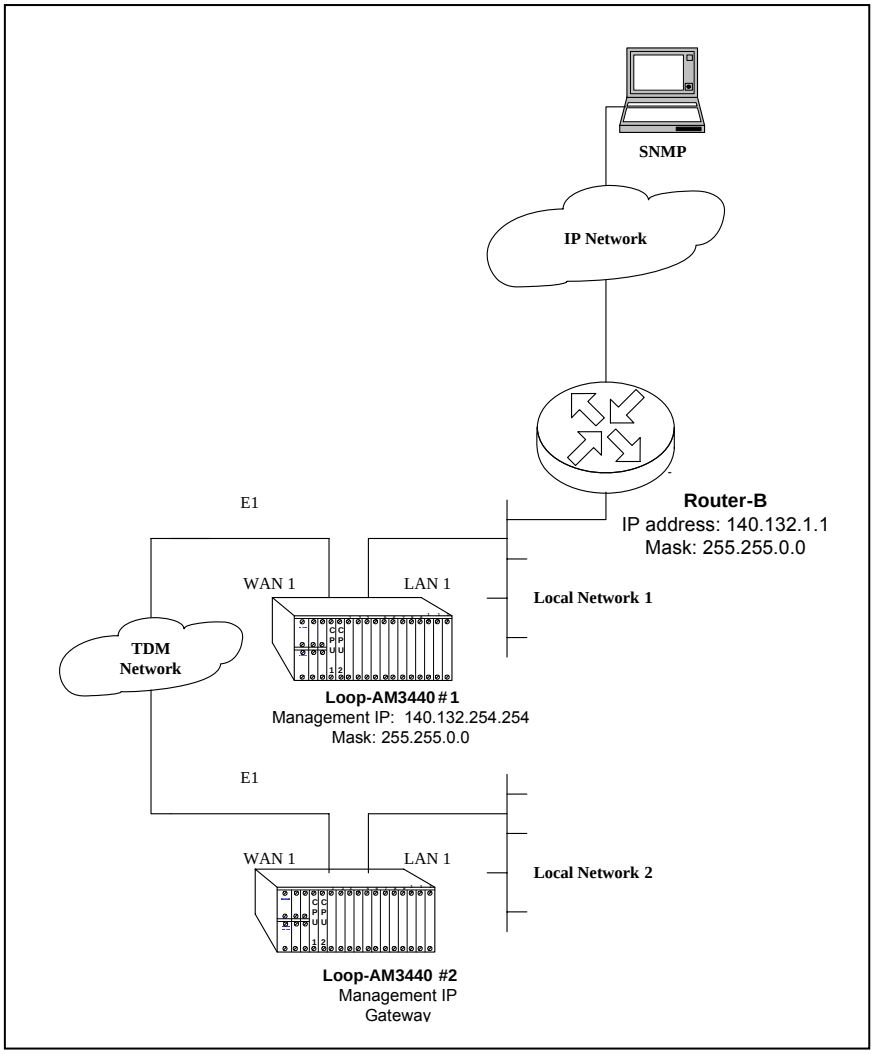


Figure 14- 1 Remote bridge mode Setup

14.1 Step by Step Setup Instructions

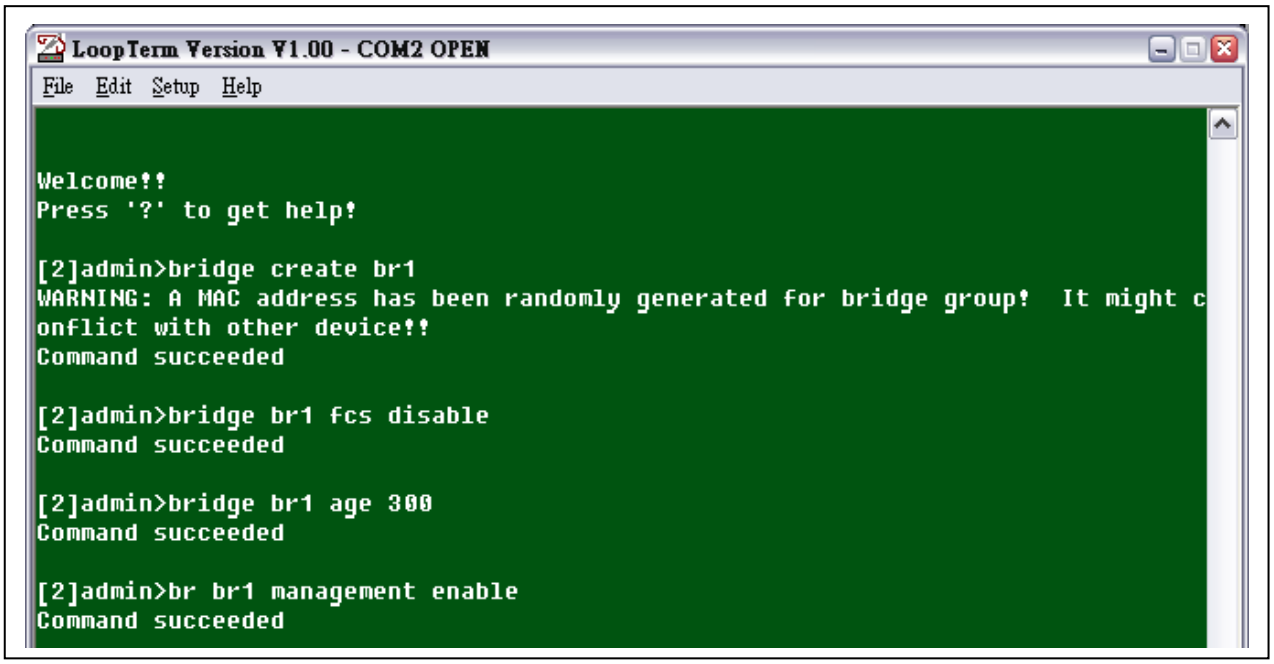
The first step is to create a bridge group for the Router-B card. Key in the command **bridge create** followed by the given name and a MAC address. Then press the Enter key.

The second parameter, MAC adress, is an optional parameter. If MAC address is not given, the Router-B card will generate the MAC address randomly. It may conflict with the MAC address of other devices.

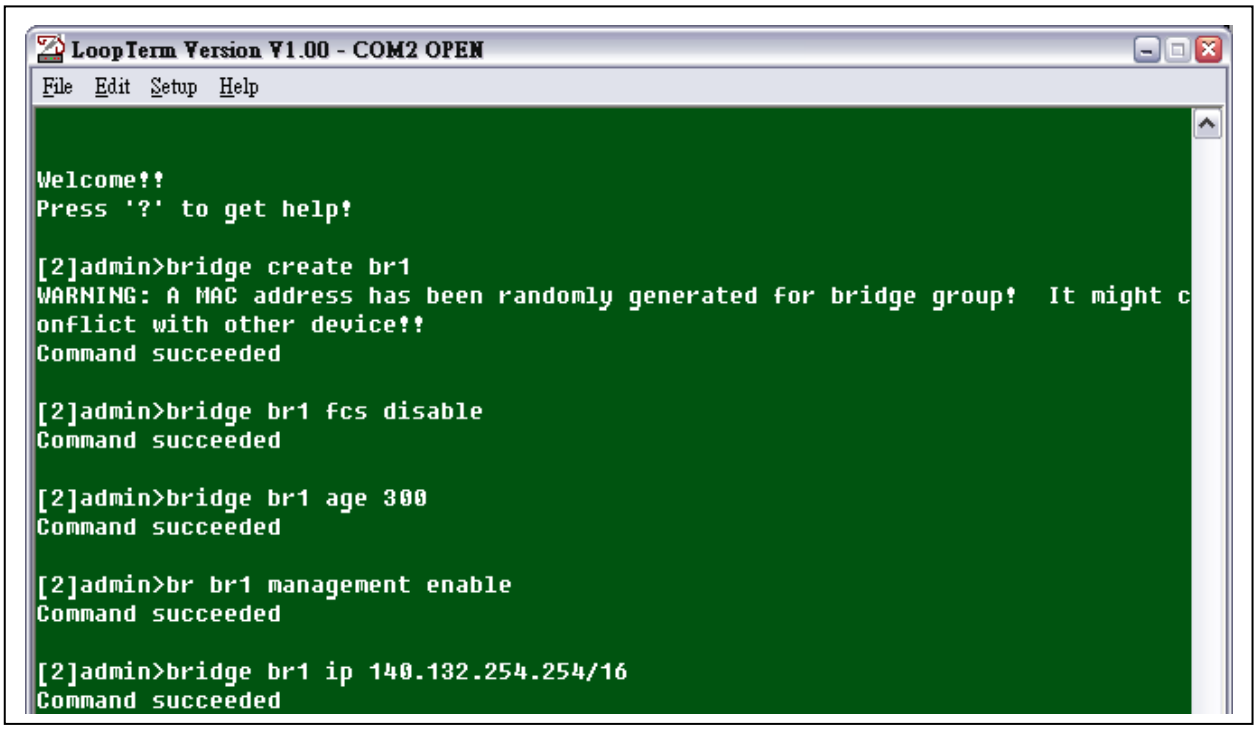
The following command can be setted up once every time for Router-B card.

Set the bridge fcs. Key in the command **bridge br1 fcs** followed by the parameter you require. Disabled have been selected as parameter in the following screen.

Set the bridge MAC age. Key in the command **bridge br1 age** followed by the bridge age value. Then press the Enter key. The value range is from 10 to 1000000. 300 seconds had been setup as the IEEE 802.1d default aging time in five minutes.



To setup management on bridge mode, the user have to enable bridge management feature as above.



15 STP/RSTP Setup

15.1 Overview

The Spanning Tree Algorithm can be used to detect and disable network loops and to provide backup links between bridges. This allows the device to interact with other STP/RSTP-compliant switches or bridges in a network to ensure that only one route exists between any two stations on the network and to provide backup links which automatically take over when a primary link goes down.

In Figure 15-1, below, the forwarding port in Router-B #4 is blocked so that there can only be one path between PC#1 and PC #2.

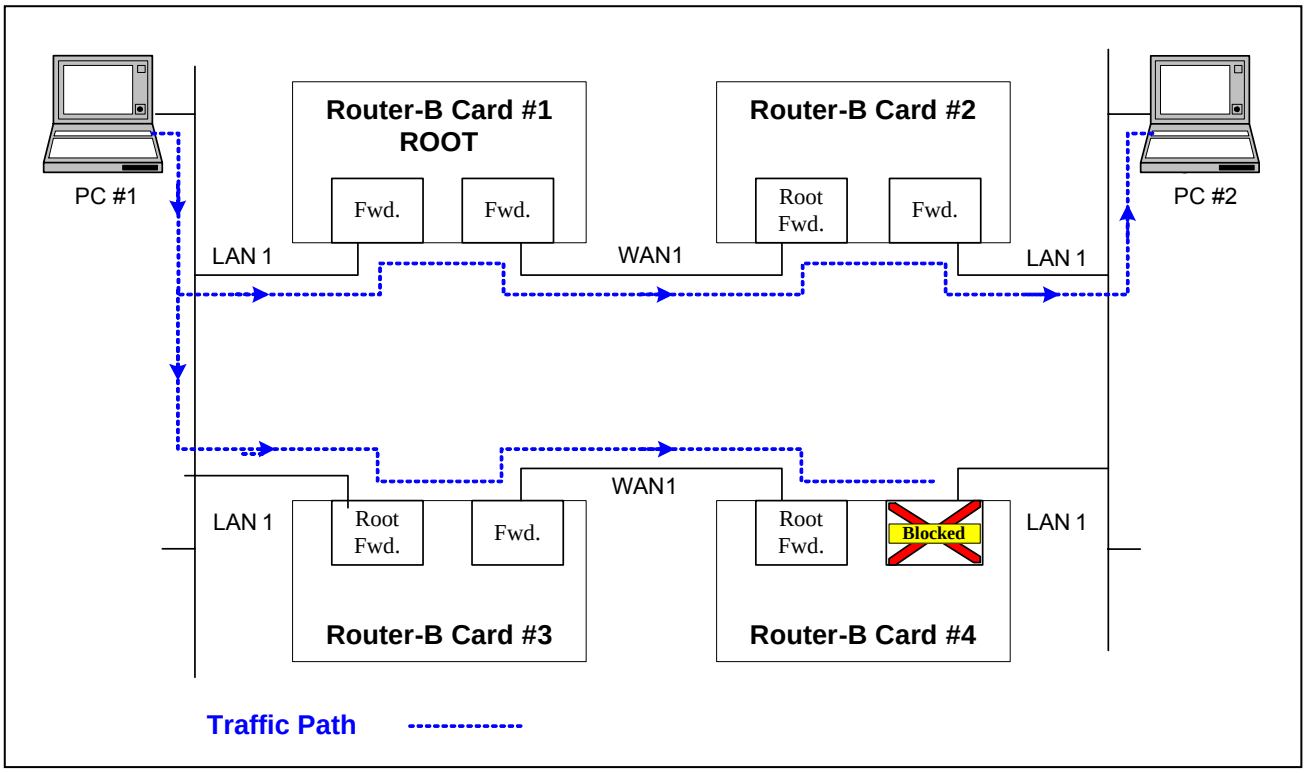


Figure 15- 1 Normal RSTP Link

In Figure 15-2, below, the WAN link between Router-B #1 and Router-B #2 has broken. The system immediately removes the forwarding port block in Router-B #4 so that there is still a path between PC #1 and PC #2

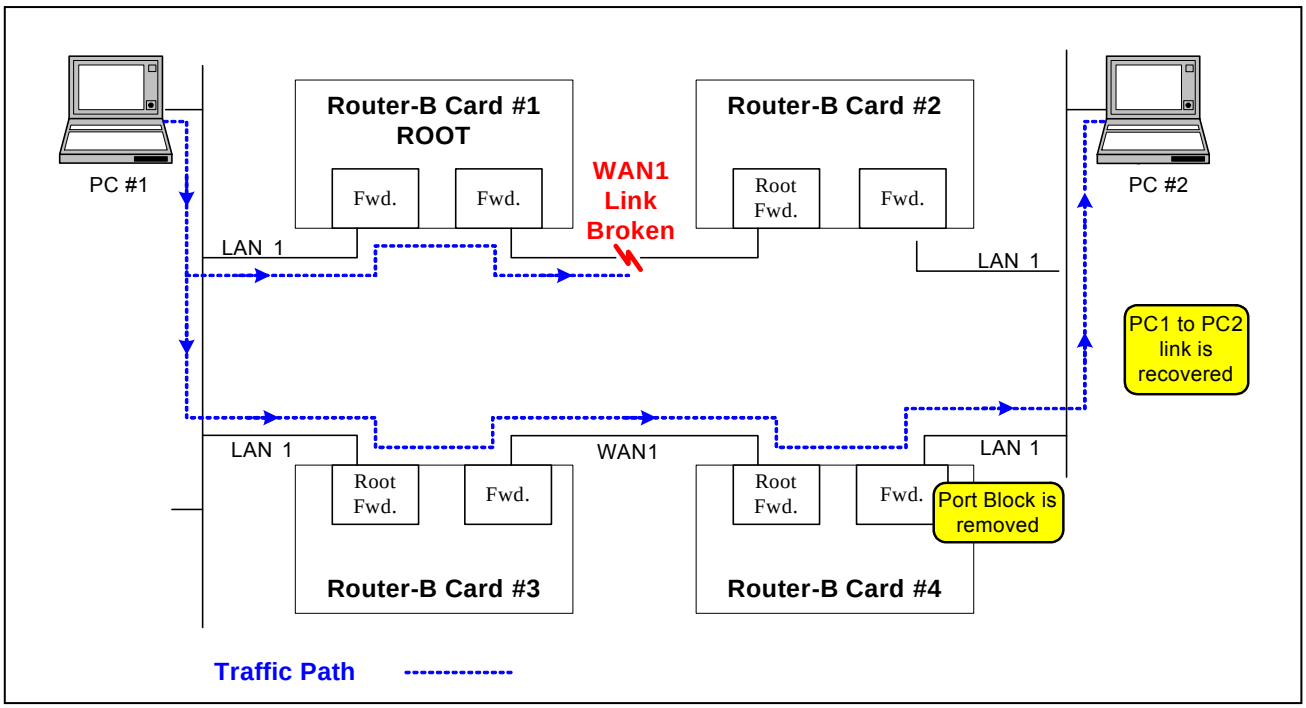


Figure 15- 2 Restored RSTP Link

The spanning tree algorithms supported by this device include these versions:

• STP – Spanning Tree Protocol (IEEE 802.1d)
• RSTP – Rapid Spanning Tree Protocol (IEEE 802.1w)

Spanning tree algorithm uses a distributed algorithm to select a bridging device that serves as the root of the spanning tree network. It selects a root port on each bridging device (except for the root device) which incurs the lowest path cost when forwarding a packet from that device to the root device. Then it selects a designated bridging device from each LAN, which incurs the lowest path cost when forwarding a packet from that LAN to the root device. All ports connected to designated bridging devices are assigned as designated ports. After determining the lowest cost spanning tree, it enables all root ports and designated ports, and disables all other ports. Network packets are therefore only forwarded between root ports and designated ports, eliminating any possible network loops.

Once a stable network topology has been established, all bridges listen for Hello BPDUs (Bridge Protocol Data Units) transmitted from the Root Bridge. If a bridge does not get a Hello BPDU after a predefined interval (Maximum Age), the bridge assumes that the link to the Root Bridge is down. This bridge will then initiate negotiations with other bridges to reconfigure the network topology. RSTP is designed as a general replacement for the slower, legacy STP. RSTP achieves much faster reconfiguration (i.e., around one tenth of the time required by STP) when a node or port fails.

Performance of the Bridges recommends default operational values for performance parameters. These have been specified in order to avoid the need to set values prior to operation, and have been chosen with a view to maximizing the ease with which Bridged LAN components interoperate. Recommended default, absolute maximum, and ranges of parameters are specified in Tables 15-1 through 15-3.

Table 15- 1 Transit and transmission delays

Parameter	Recommended value	Absolute maximum
Maximum bridge transit delay	1.0	4.0
Maximum BPDU transmission delay	1.0	4.0
Maximum Message Age increment overestimate	1.0	4.0

All times are in seconds.

Table 15- 2 (Rapid) Spanning Tree algorithm timer values

Parameter	Recommended or default value	Fixed value	Range
Bridge Hello Time	2.0	—	1.0-10.0
Bridge Max Age	20.0	—	6.0-40.0
Bridge Forward Delay	15.0	—	4.0-30.0
Transmission Limit	3	—	—

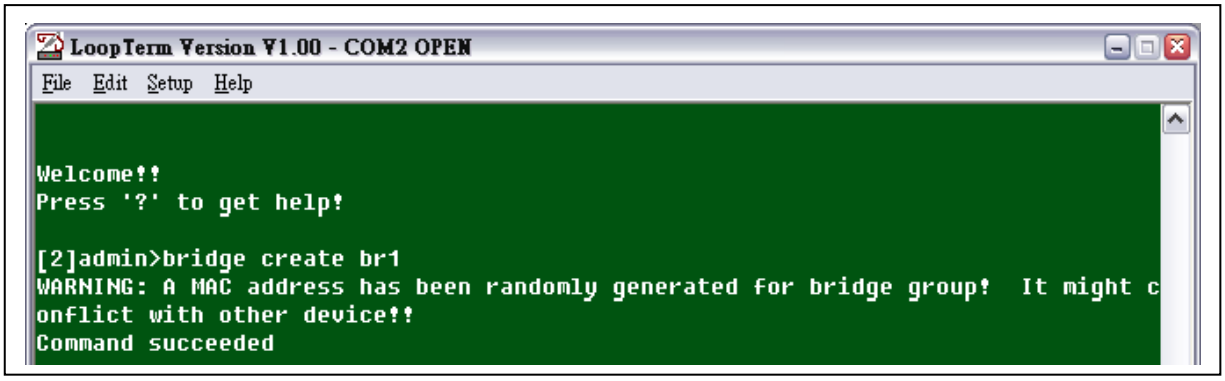
All times are in seconds.

Table 15- 3 Bridge and port priority parameter values

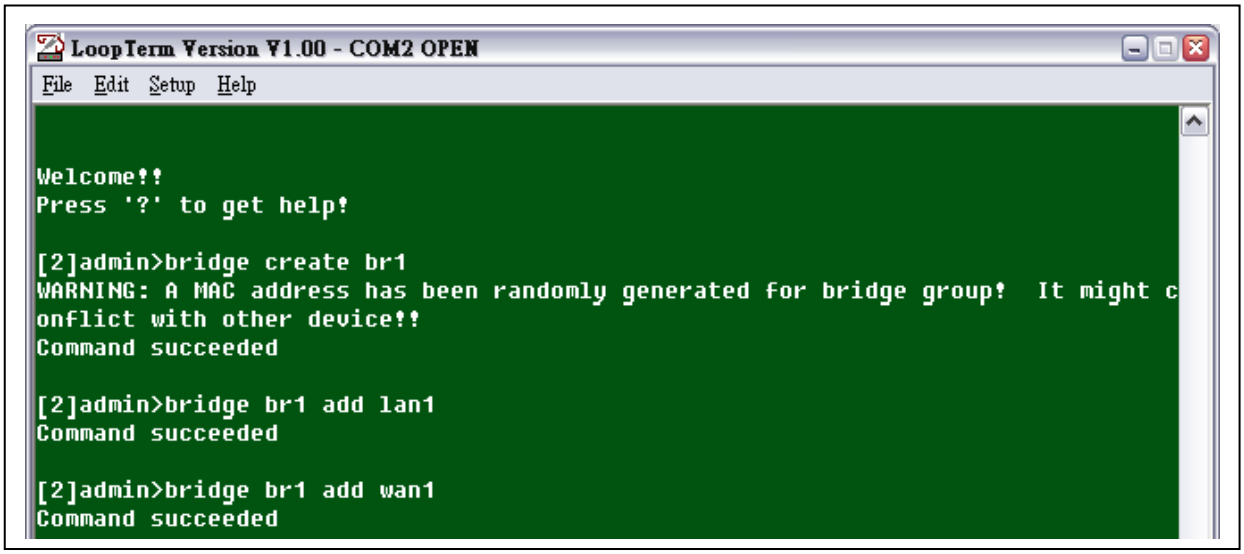
Parameter	Recommended or default value	Range
Bridge Priority	32768	0-61440 in steps of 4096
Port Priority	128	0-240 in steps of 16

15.2 Step by Step Setup Instructions

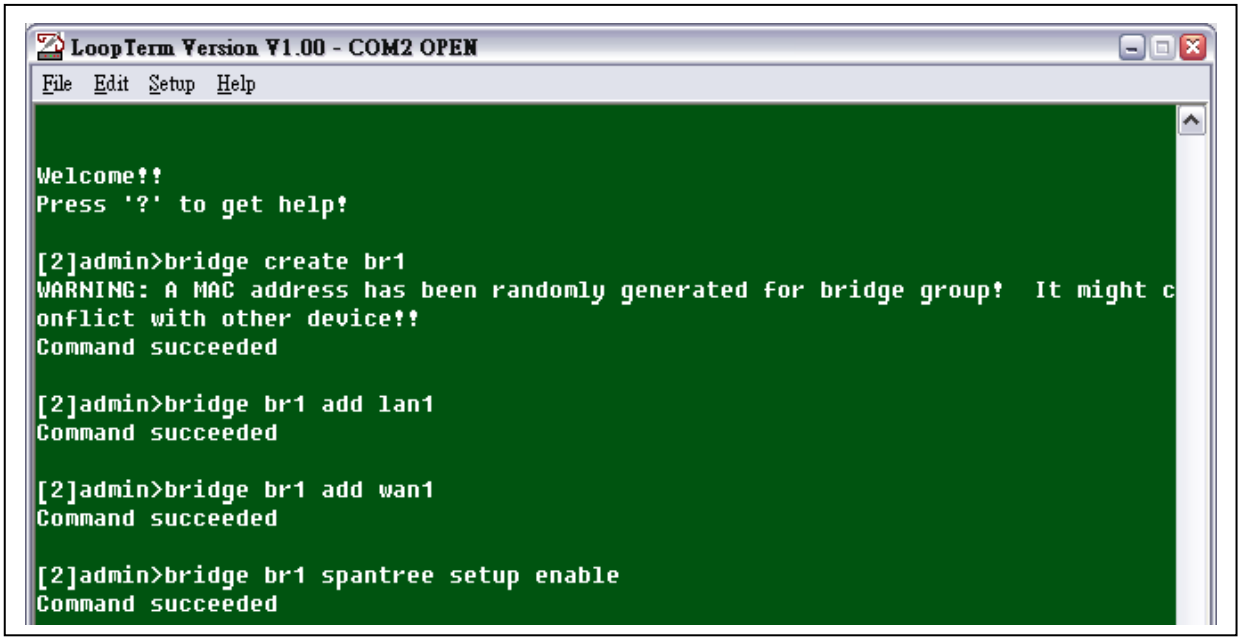
To enable STP/RSTP service, a bridge group must be setup properly in advance. The first step is to create a bridge group for the Router-B card. Key in the command **bridge create** followed by the given name and a MAC address.



Set WAN port and LAN port to run bridge mode. Key in the command **bridge br1 add lan1 and bridge br1 add WAN1**.

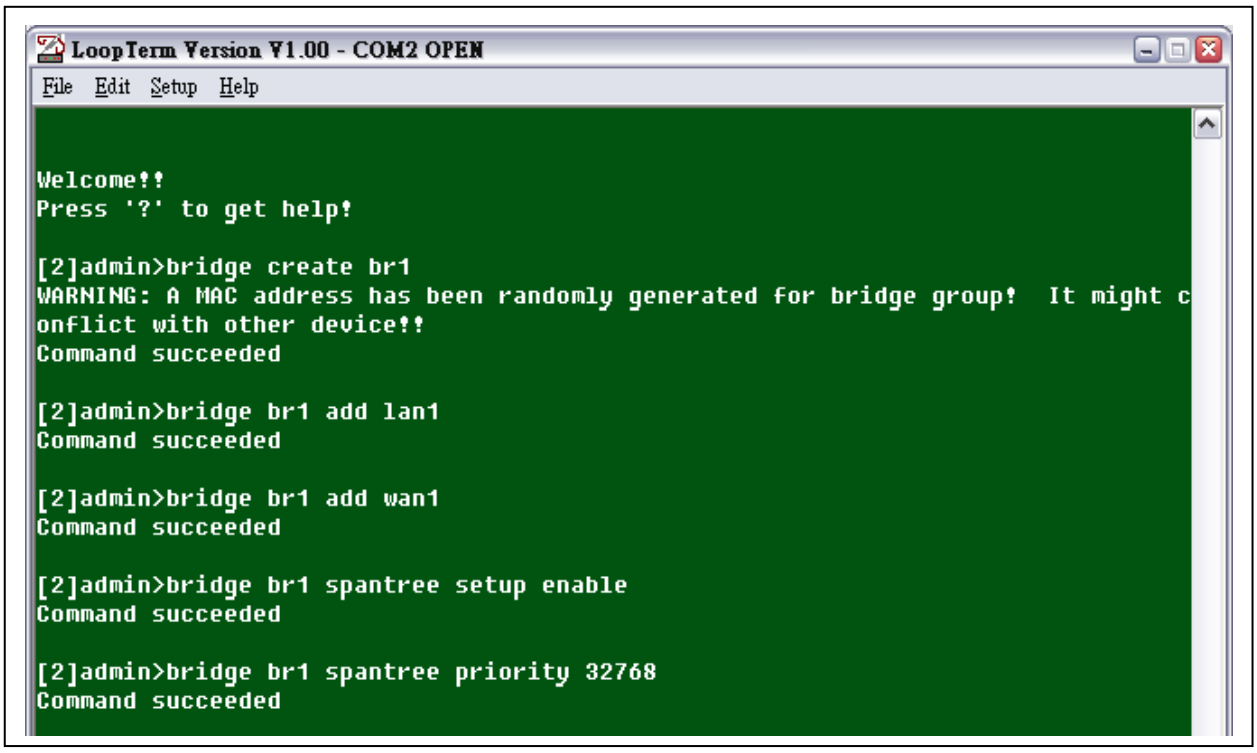


Key in the command **bridge br1 spantree** to **enable** spanning tree protocol.

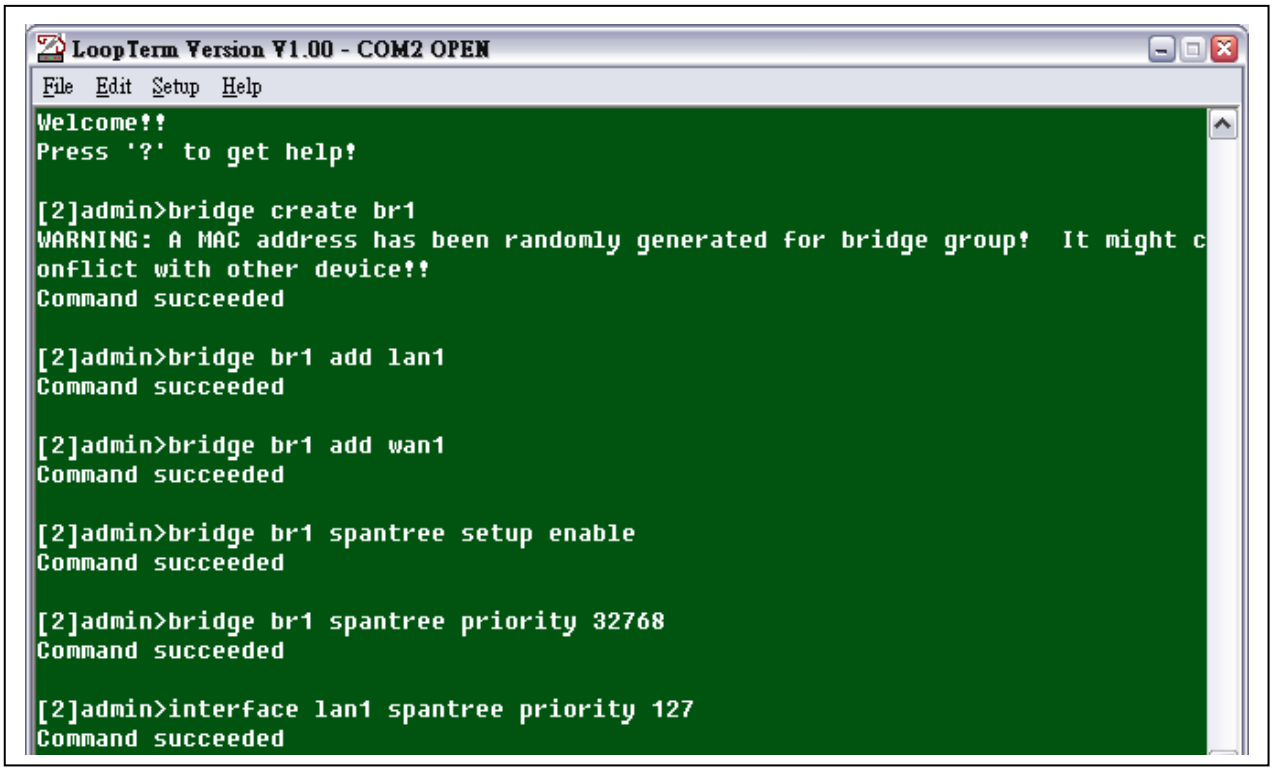


Note: Key in the command **show bridge br1 config** and then press the Enter key.

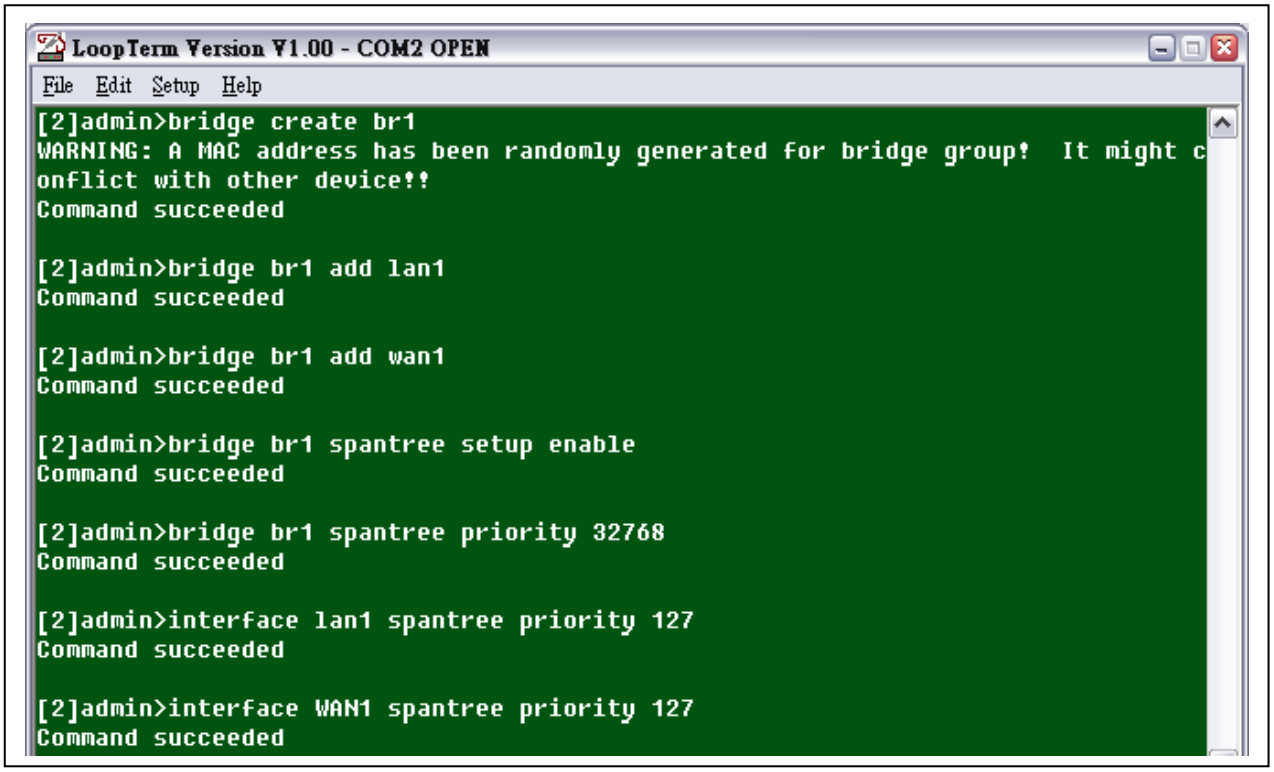
Key in the command **bridge br1 spantree priority** followed by the bridge priority value you decide to use. Then press the Enter Key. We used **32768**. In the sample screen below.



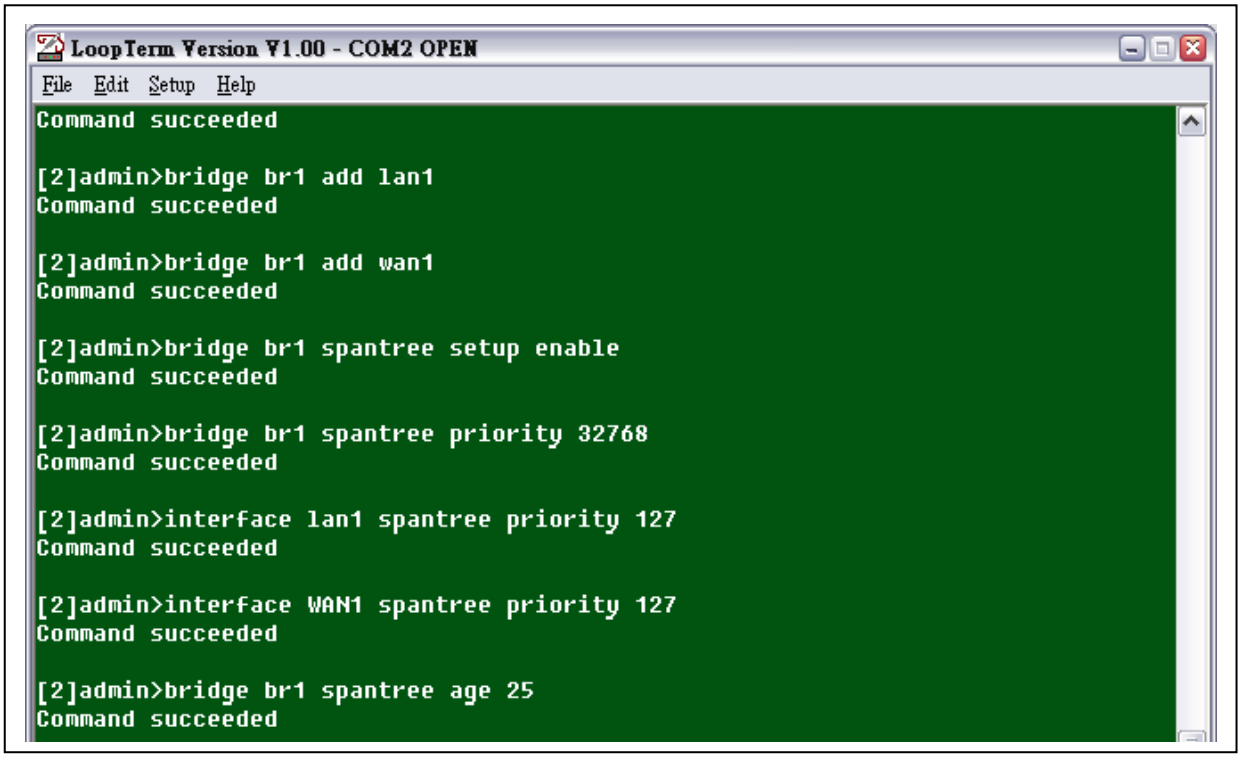
Set up the LAN port priority. Key in the command **interface lan1 spantree priority** followed by the priority value (**127**). Press Enter. A sample screen is shown below.



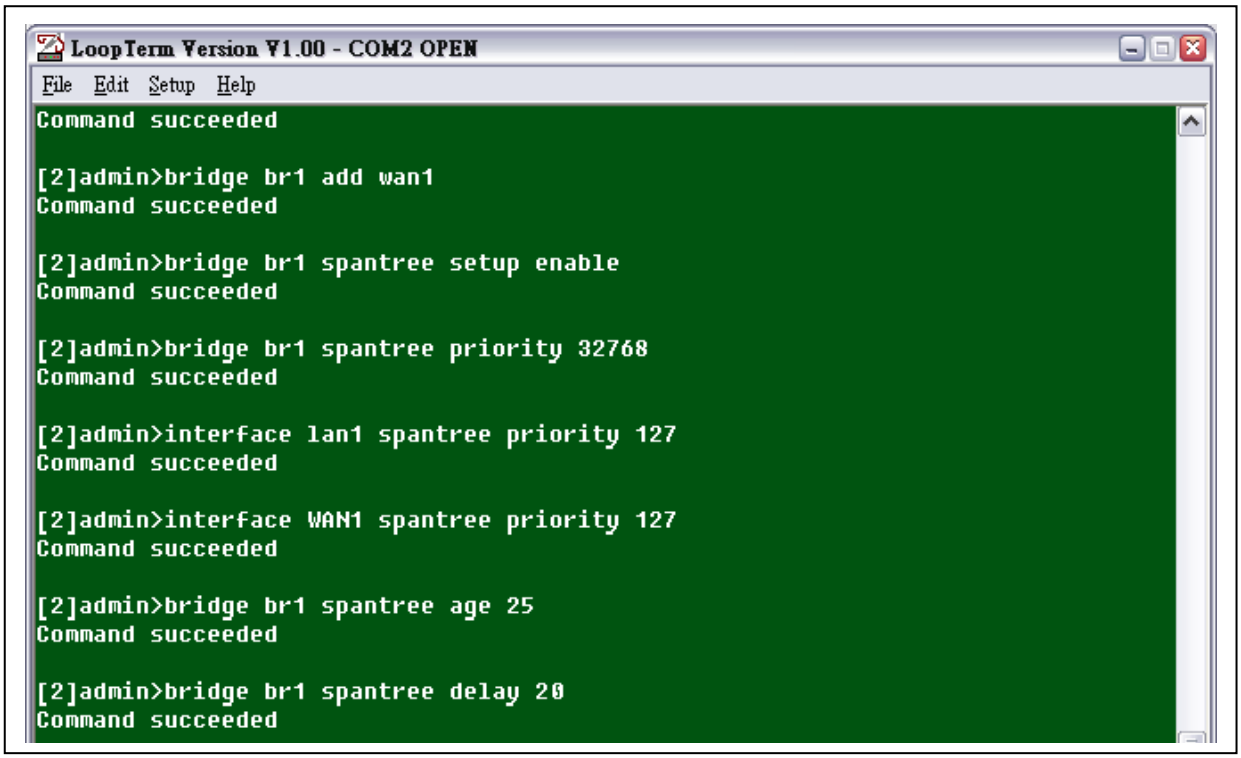
Set up the WAN port firstly. Key in the command **interface WAN1 spantree priority** followed by the priority value (**127**). Press Enter. A sample screen is shown below.



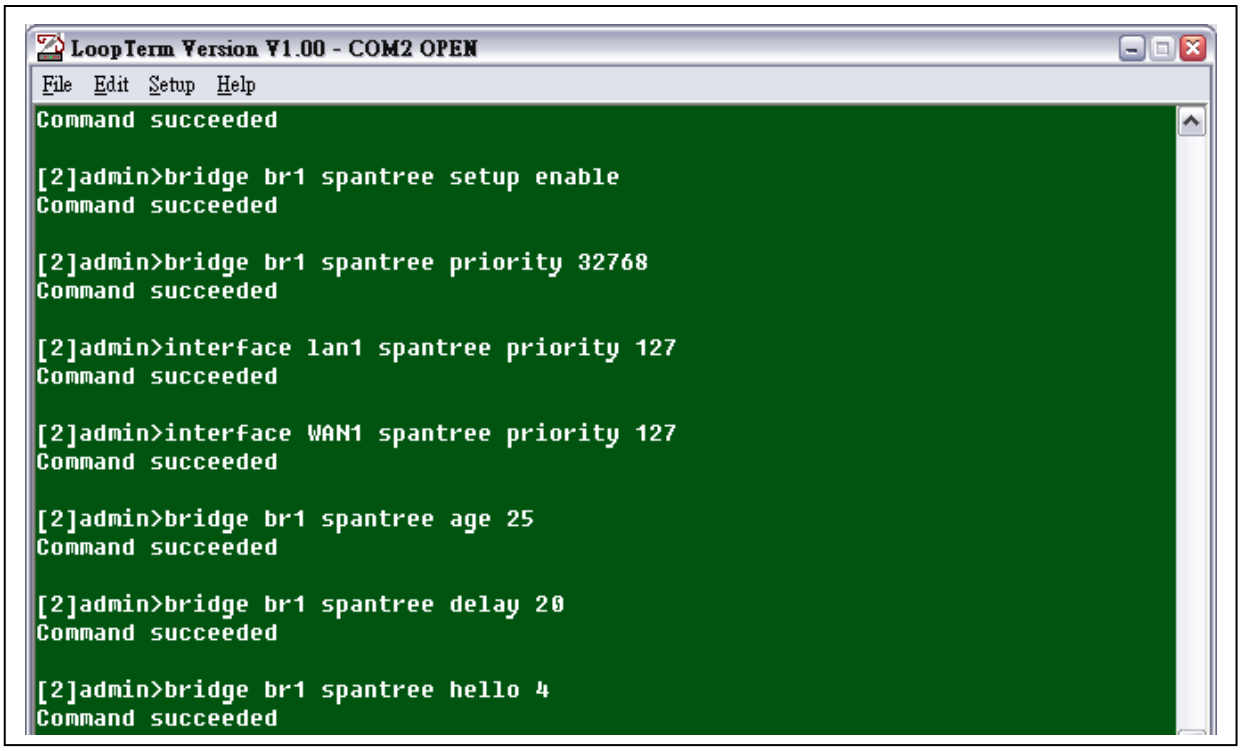
Set up the span tree Bridge Max Age, key in the command **bridge br1 spantree age** followed by a time value in seconds (**25**). Press Enter. A sample screen is shown below.



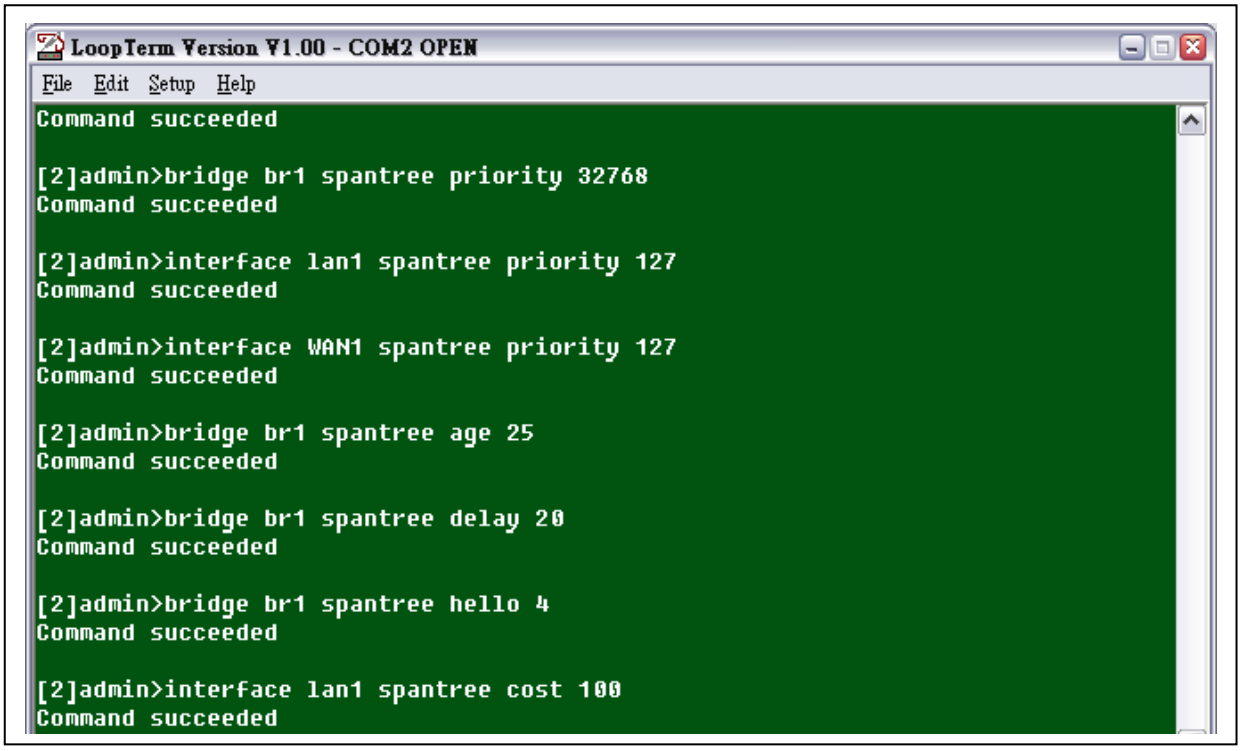
Set up the span tree Bridge Forward Delay, key in the command **bridge br1 spantree delay** followed by a time value in seconds (**20**). Press Enter. A sample screen is shown below.



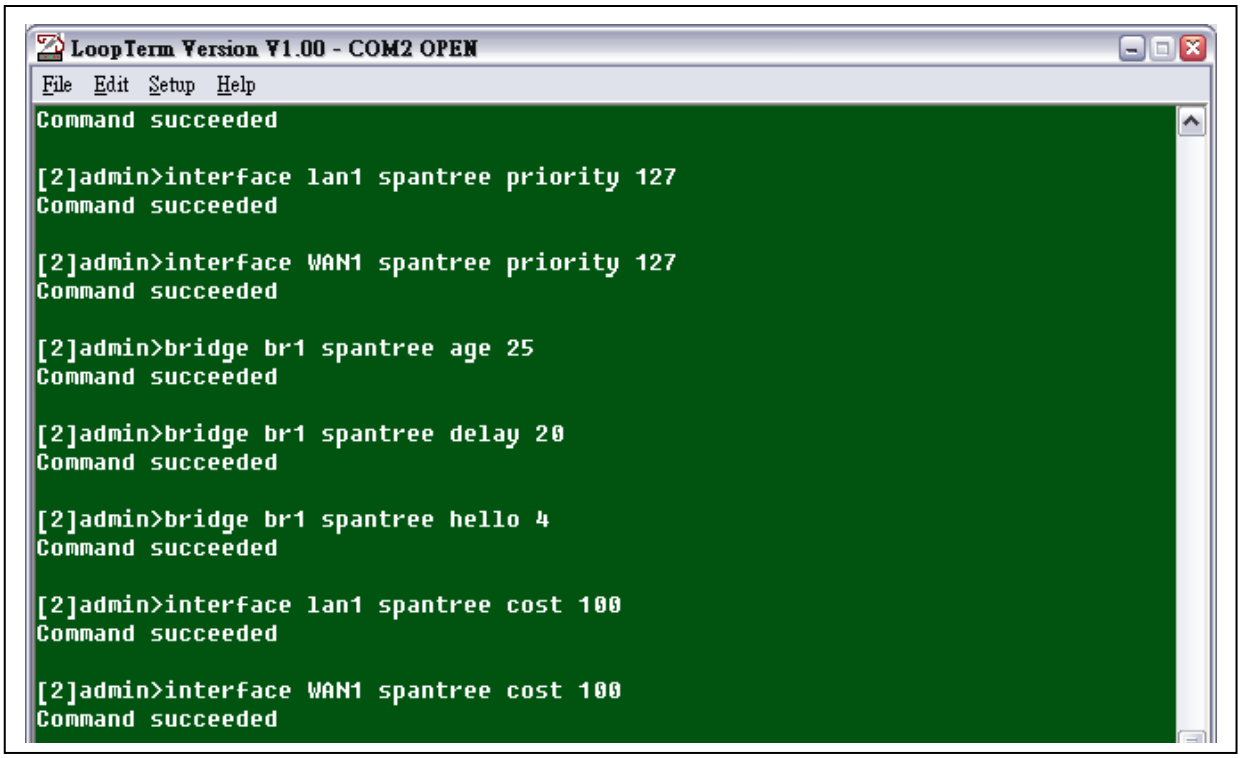
Set up the span tree Hello Time, key in the command **bridge br1 spantree hello** followed by a time value in seconds (**4**). Press Enter. A sample screen is shown below.



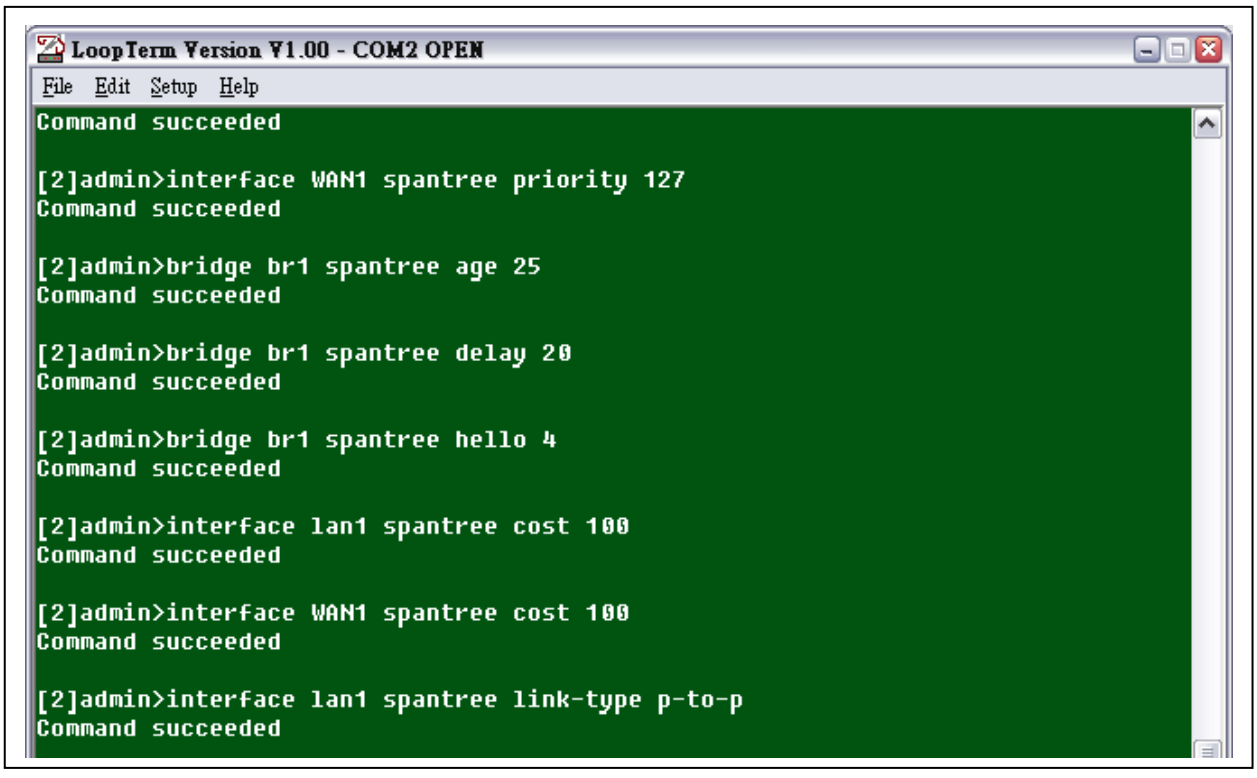
Set up the LAN port cost. Key in the command **interface lan1 spantree cost** followed by the cost value (**100**). Press Enter. A sample screen is shown below.



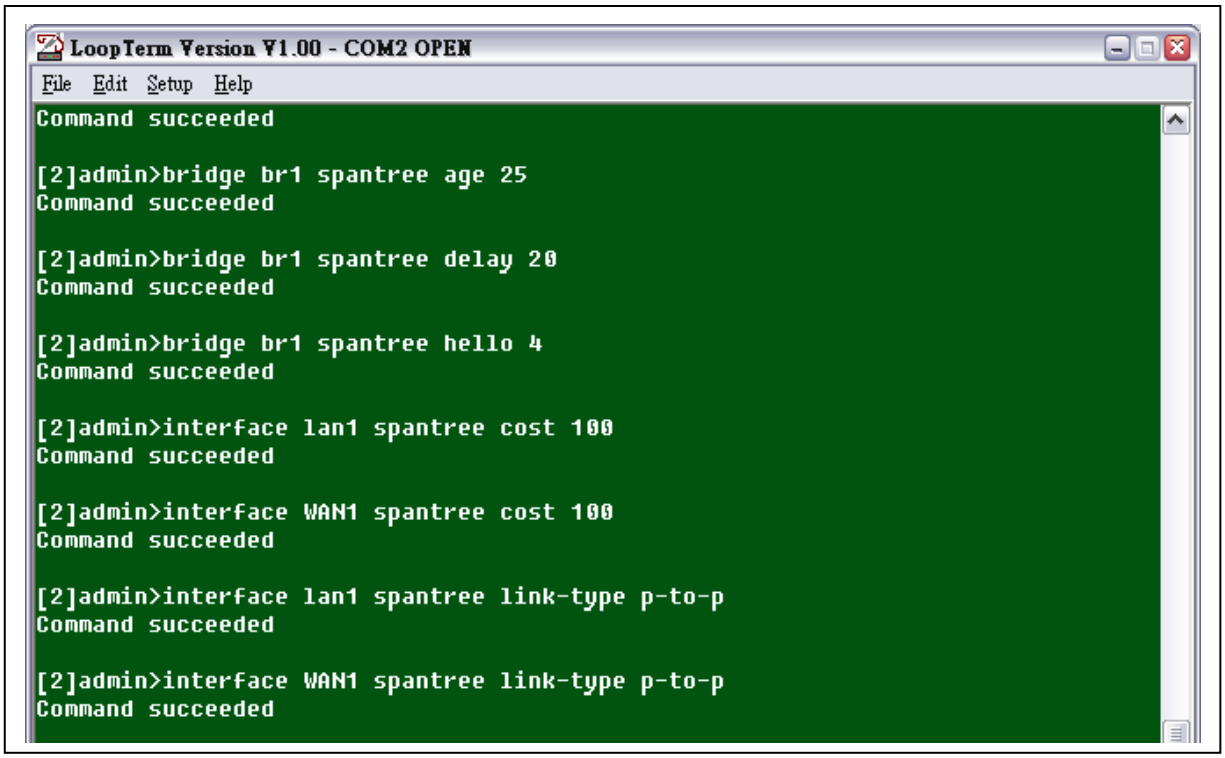
Set up the WAN port cost. Key in the command **interface WAN1 spantree cost** followed by the cost value (**100**). Press Enter. A sample screen is shown below.



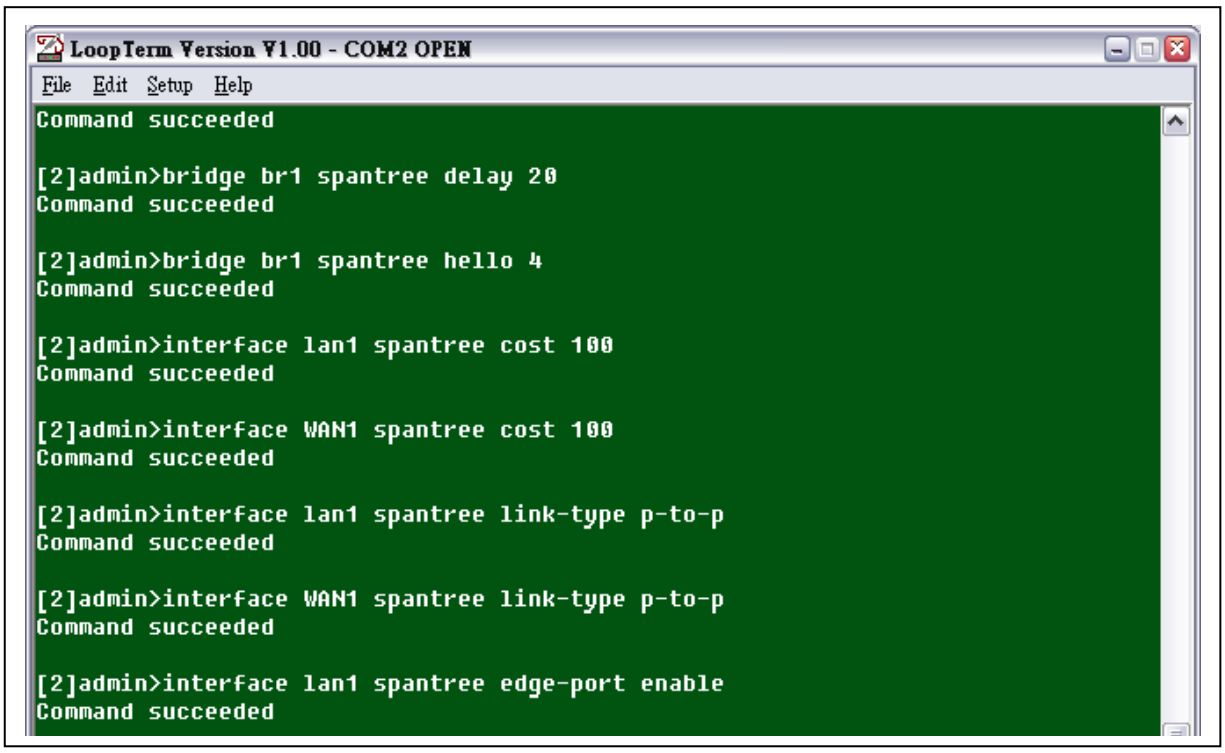
Set up the LAN span tree link type. Key in the command **interface lan1 spantree link-type** followed by the type of link (**p-to-p**). Press Enter. A sample screen is shown below.



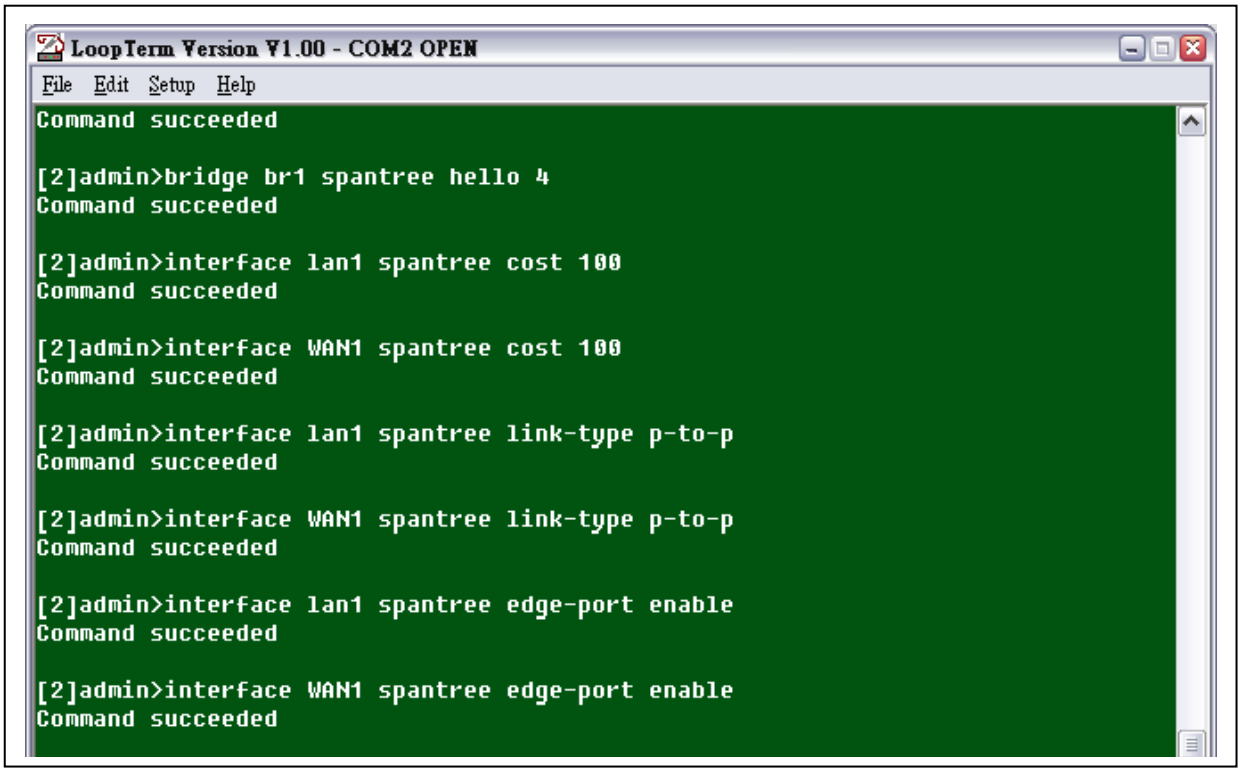
Set up the WAN span tree link type. Key in the command **interface WAN1 spantree link-type** followed by the type of link (**p-to-p**). Press Enter. A sample screen is shown below.



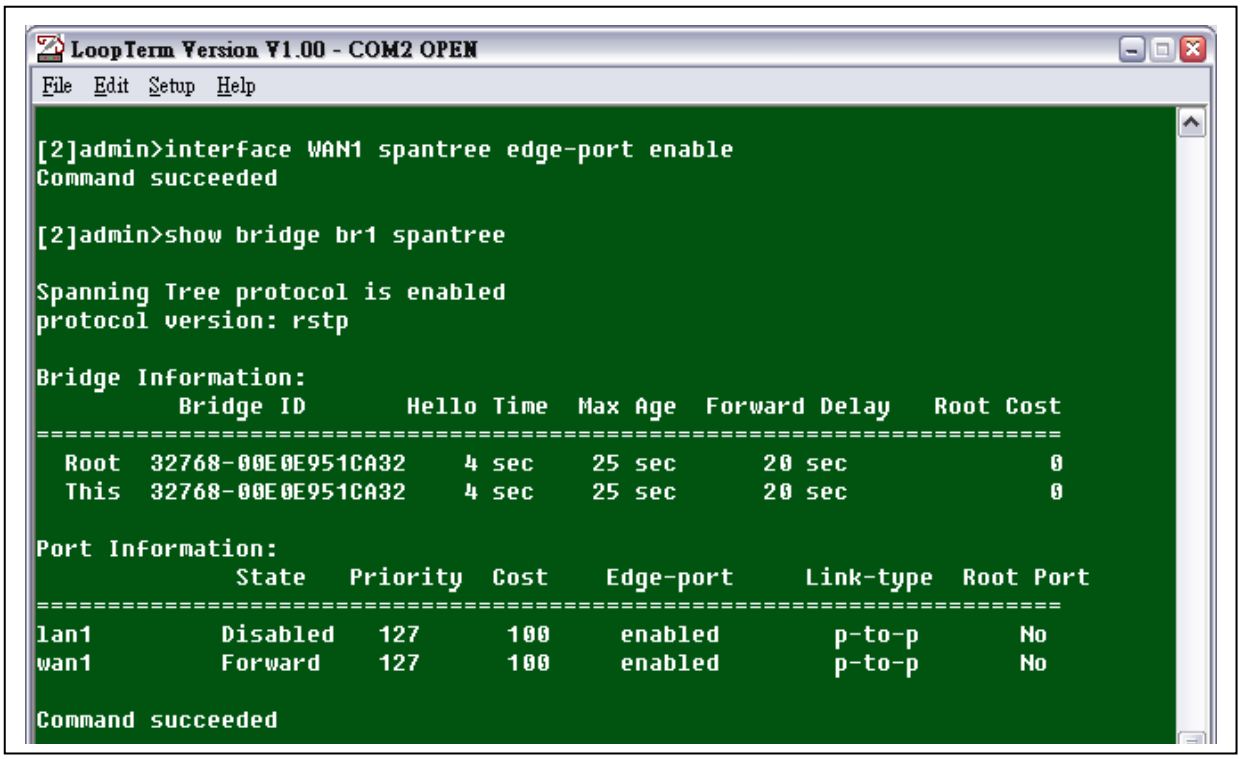
Set the LAN edge-port to enable. Key in the command **interface lan1 spantree edge-port** followed by **enable**. Press Enter. A sample screen is shown below.



Set the WAN edge-port to enable. Key in the command **interfae WAN1 spantree edge-port** followed by **enable**. Press Enter. A sample screen is shown below.



The setup procedure is now complete. If you WANt to see what your setup looks like, key in the command **show bridge br1 spantree** and press Enter. A sample display is shown below.



16 VLAN

16.1 Overview

VLAN is used to subdivide a LAN into smaller entities known as VLAN1, VLAN2, VLAN3, ….. VLAN 4094. A device in a particular VLAN can monitor traffic in that VLAN only, and cannot monitor packets in any other VLANs. This provides an important level of security and also assists the user to do certain kinds of QoS**.**

In Figure 16-1, below, VLAN1 and VLAN2 both feed into the VLAN-aware Ethernet Switch. The switch assigns a Port VID to each port. VLAN1 is assigned VID:3 and VLAN2 is assigned VID:5. Transmissions from VLAN1(VID:3) and VLAN2(VID:5) are put into tagged packets by the switch and then passed on to the Ethernet Port of the Router-B card.

The Router-B card reads the tag on the packets and uses this VLAN id to make packet forwarding decisions. In the diagram below, the packets are to be sent via an E1 or DS1 interface to the Network. A physical interface such as an E1 or DS1 interface can carry multiple logical channels. Each of these channels can carry VLAN traffic(eg. VID:3, WAN1). The router-B forwards packets of a VLAN to a proper logical chanel according to the tags on the packets.

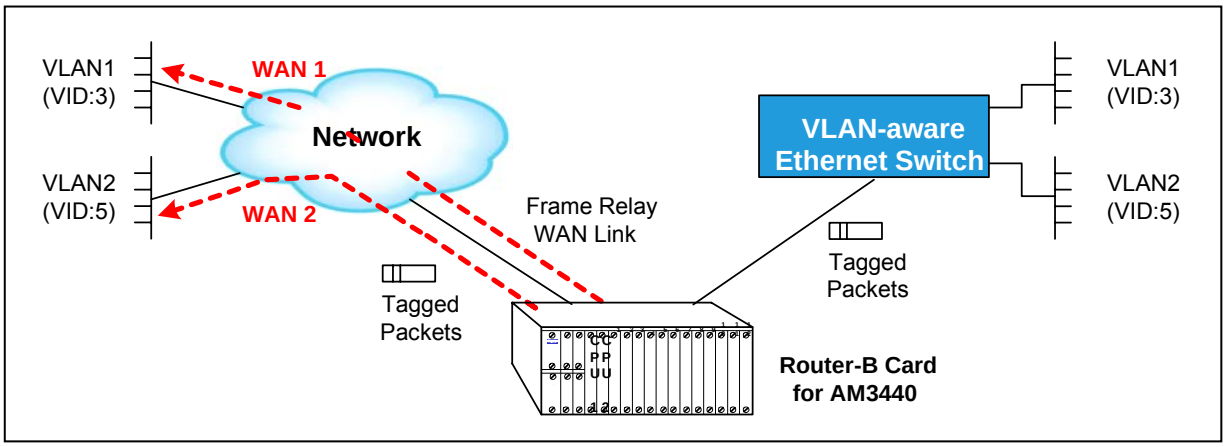


Figure 16- 1 VLAN Application #1

Figure 16-2, below, is much like Figure 16-1, except that it contains both tagged and untagged packets on the ethernet side. The Router-B assigns a default VLAN ID to untagged packets (ie.VLAN3 packets in the diagram). The default VID is always the the Port VID of the Ehernet Port.

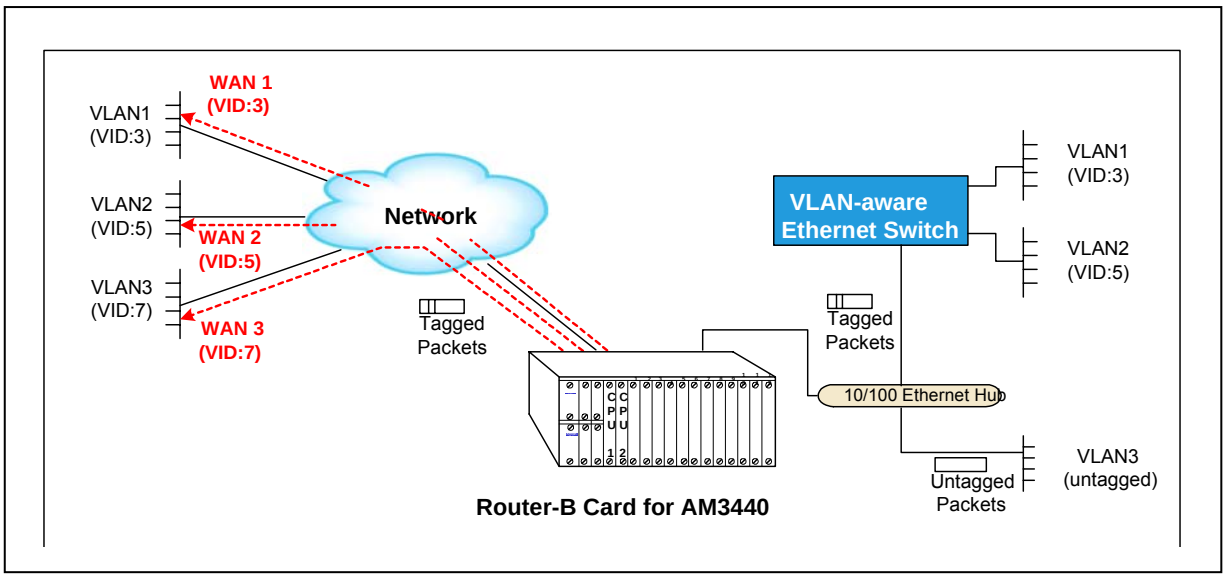


Figure 16- 2 VLAN Application #2

16.2 VLAN Setup Instructions

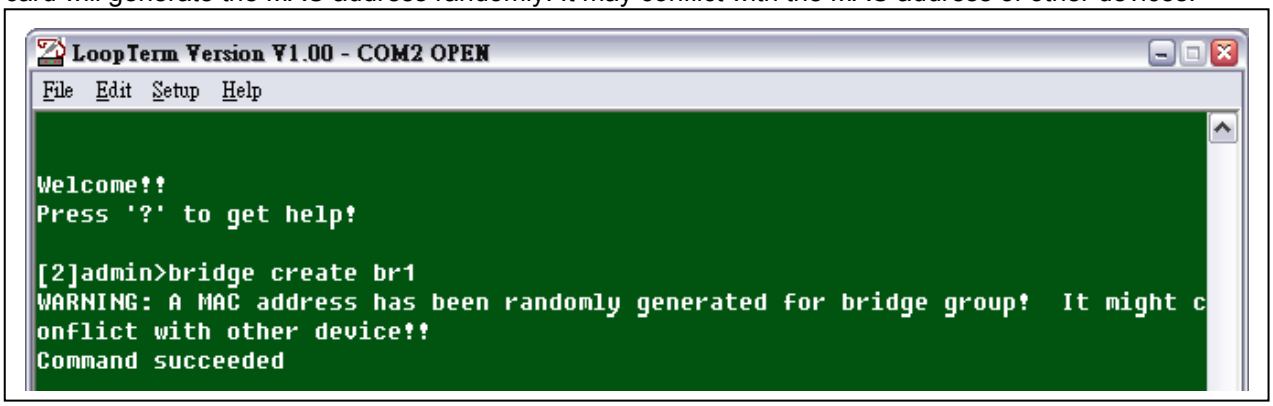
16.2.1 Application #1 (Fig. 16-1) Step by Step Setup Instructions

Connect a cable between the COM port of your PC and the Console port of the AM3440. Then follow the instructions below.

1. bridge mode and Timeslot Setting

The first step is to create a bridge group for the Router-B card. Key in the command **bridge create** followed by the given name and a MAC address. Then press the Enter key.

The second parameter, MAC adress, is an optional parameter. If MAC address is not given, the Router-B card will generate the MAC address randomly. It may conflict with the MAC address of other devices.

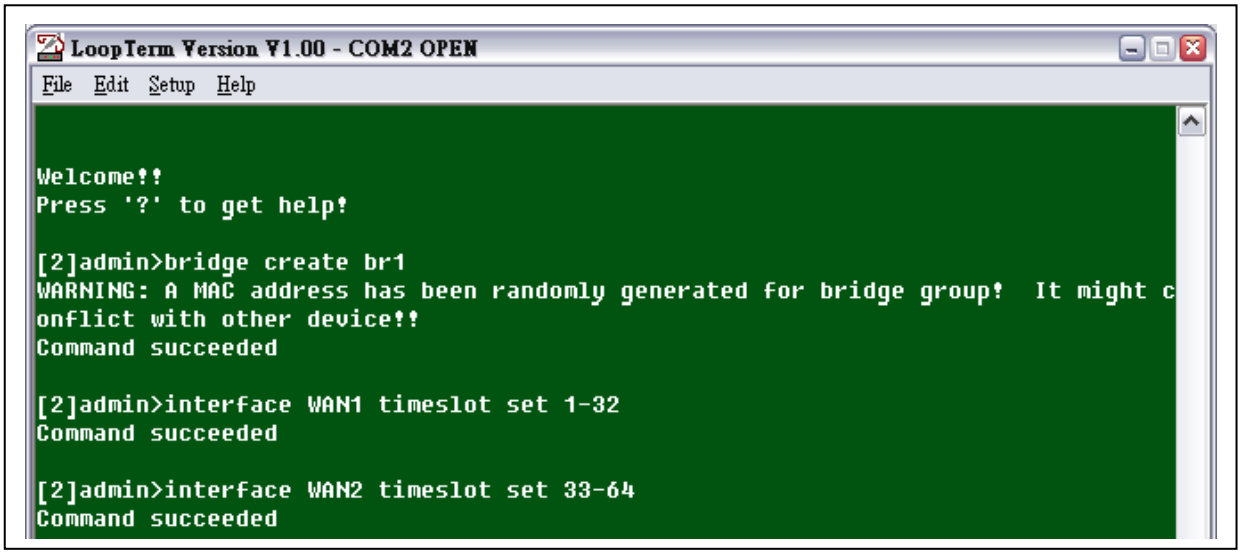


For WAN interface setup, there are WAN1and WAN2 for setting.

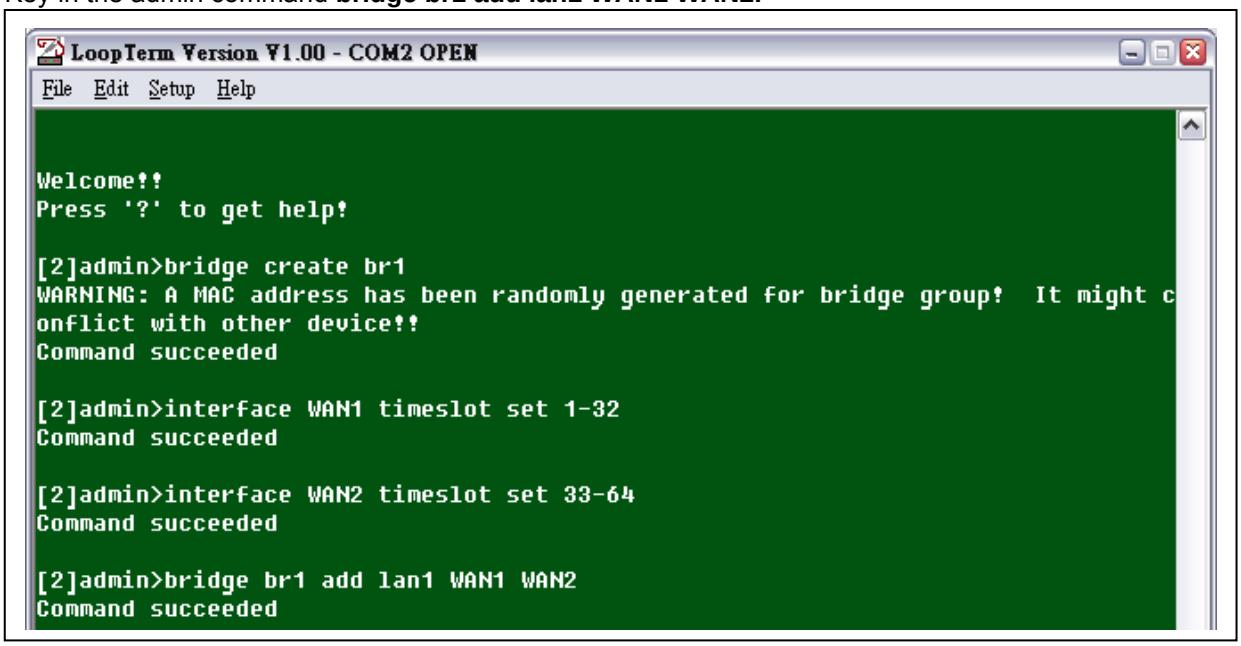
Router-B card supports mutiple WAN interfaces. Before configuring each WAN interface, it needs to setup the timeslot map in advance.

Key in the command **interface WANXX timeslot set** to assgin timeslots to interface WAN1. The following example assigns 32 timeslots to interface WAN1 from timeslot **1** to timeslot **32**.

Key in the command **interface WANXX timeslot set** to assgin timeslots to interface WAN2. The following example assigns 32 timeslots to interface WAN2 from timeslot **33** to timeslot **64**.



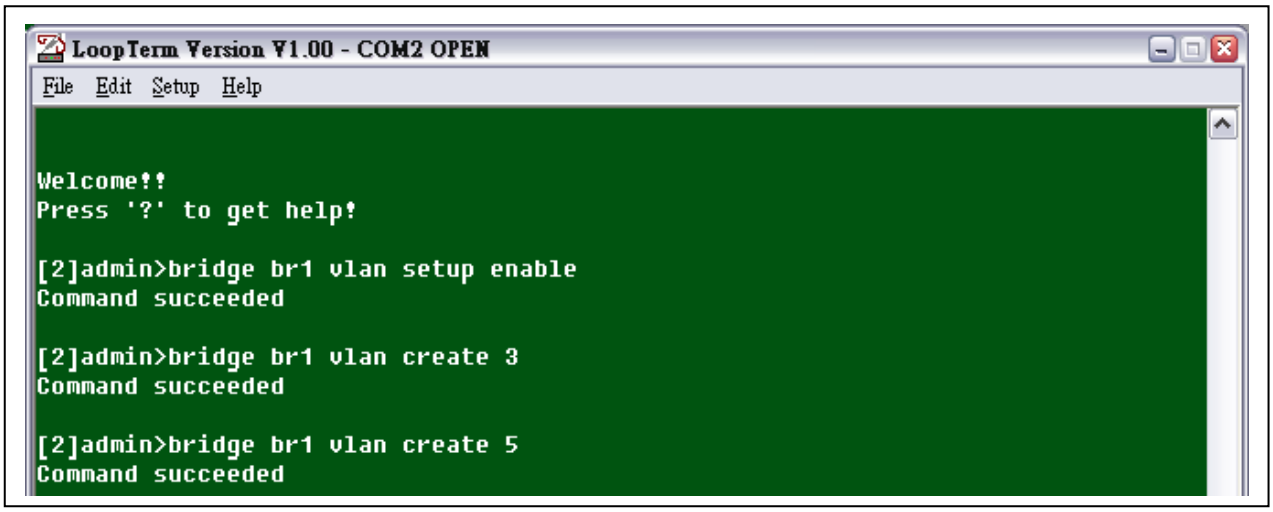
Key in the admin command **bridge br1 add lan1 WAN1 WAN2.**



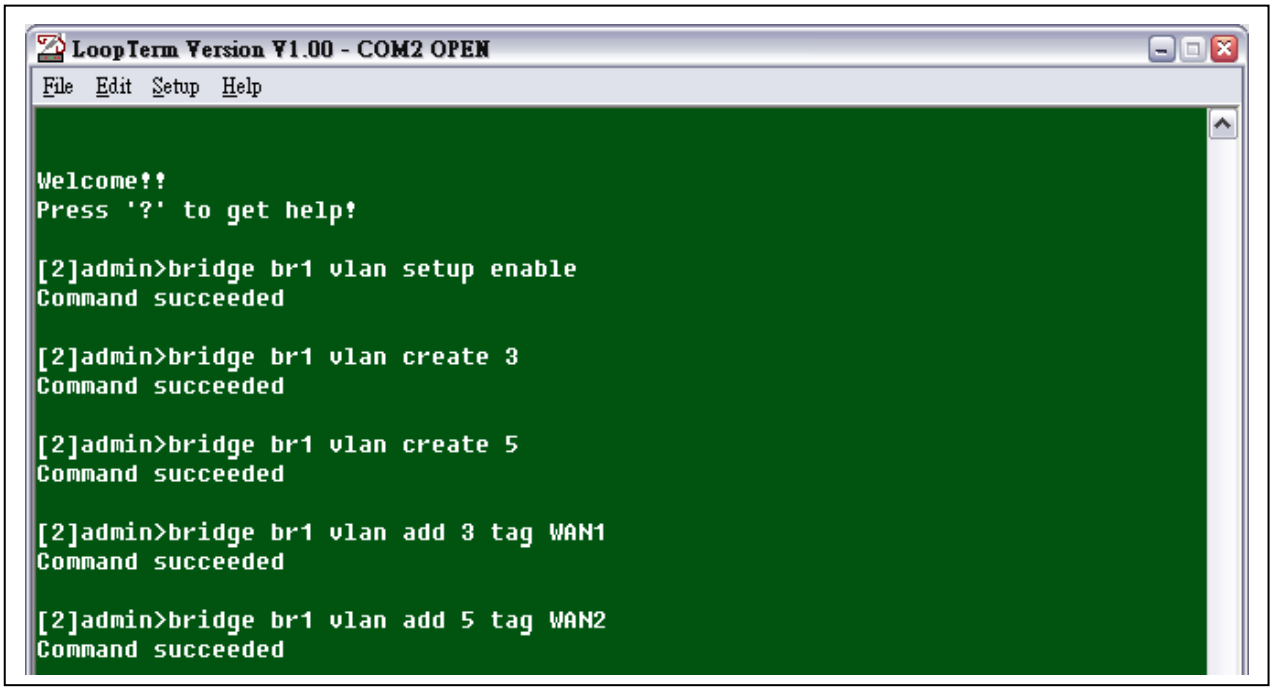
2. VLAN Setup

The VLAN have to enable on the bridge. Key in the command **bridge br1 vlan** followed by enable.

You must create a VID for each VLAN. To create VID:3 key in the command **bridge br1 vlan create 3** and press Enter. To create VID:5 key in the command **bridge br1 vlan create 5**.

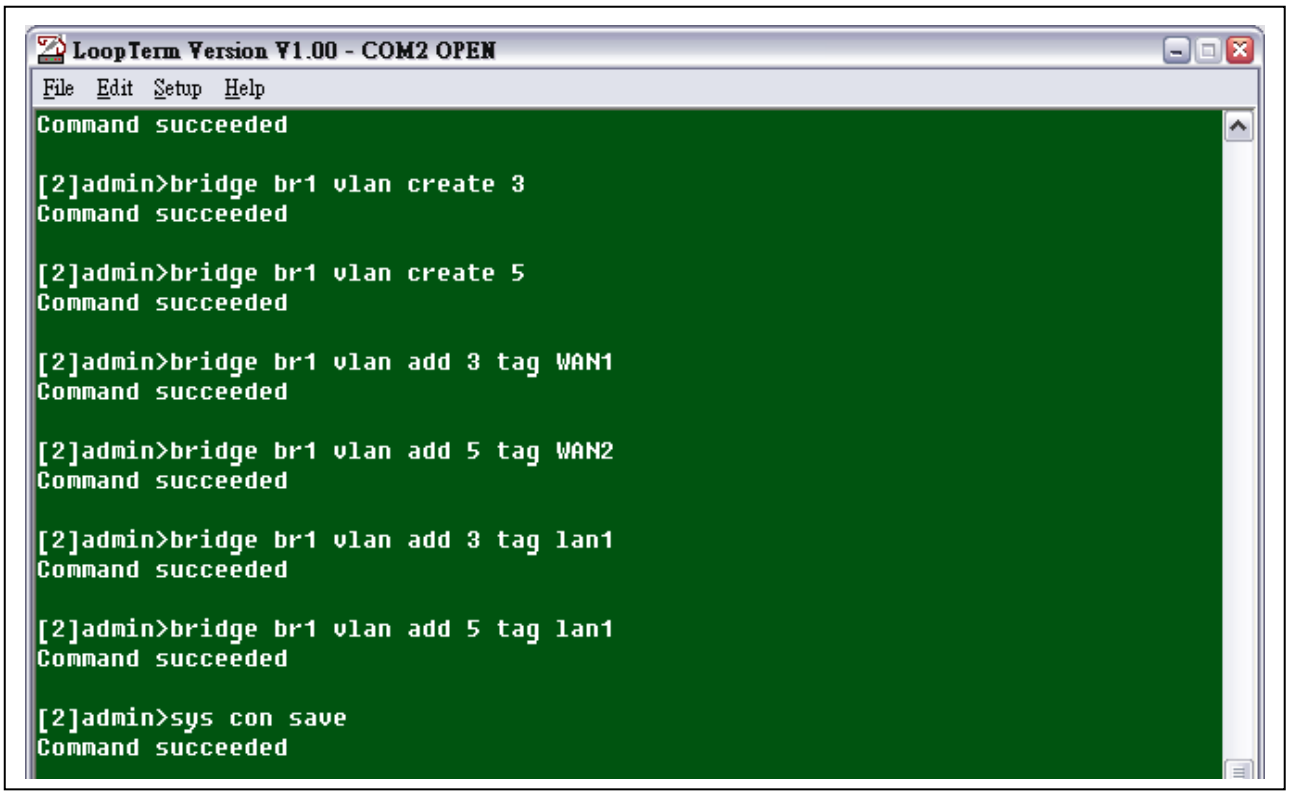


You must setup the WAN Port to allow it to process VLAN1 (VID:3) or VLAN2 (VID:5).For tagged member of VID:3 VLAN1. Key in the command **Bridge br1 vlan add 3 tag WAN1**. Press Enter. For tagged member for VID:5 VLAN2. Key in the command **Bridge br1 vlan add 5 tag WAN2**.



3. Ethernet Port Setup

You must setup the Ethernet Port to allow it to process VLAN1 (VID:3) and VLAN2 (VID:5). To set LAN1 Ethernet to be a tagged member for VID:3 VLAN1, key in the command **Bridge br1 vlan add 3 tag lan1**. Press Enter. To set LAN1 Ethernet to be a tagged member for VID:5 VLAN2, key in the command **Bridge br1 vlan add 5 tag lan1**. Press Enter.



The setup of Application #1 (Figure 16-1) is now complete.

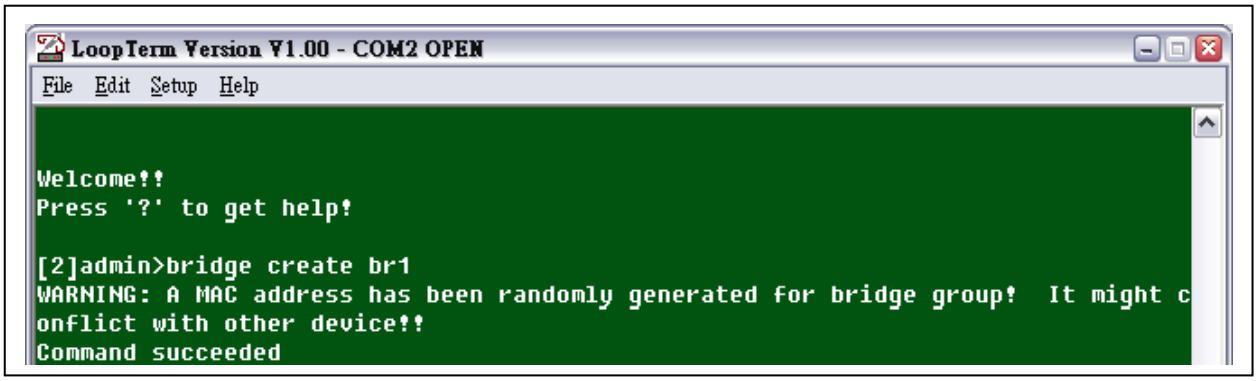
16.2.2 Application #2 (Fig. 16-2) Step by Step Setup Instructions

Connect a cable between the COM port of your PC and the Console port of the AM3440. Then follow the instructions below.

1. bridge mode and Timeslot Setting

The first step is to create a bridge group for the Router-B card. Key in the command **bridge create** followed by the given name and a MAC address. Then press the Enter key.

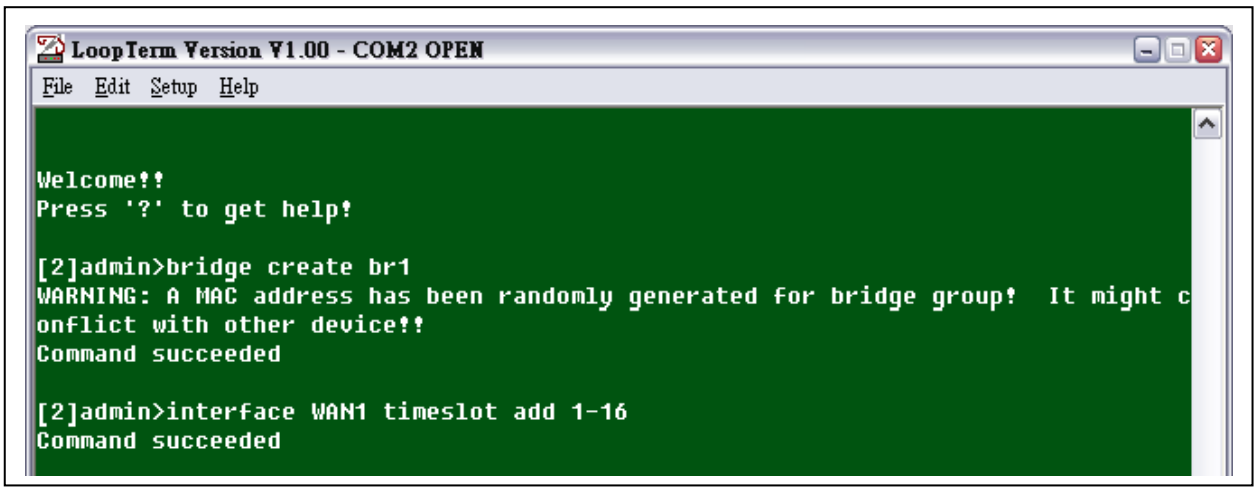
The second parameter, MAC adress, is an optional parameter. If MAC address is not given, the Router-B card will generate the MAC address randomly. It may conflict with the MAC address of other devices.



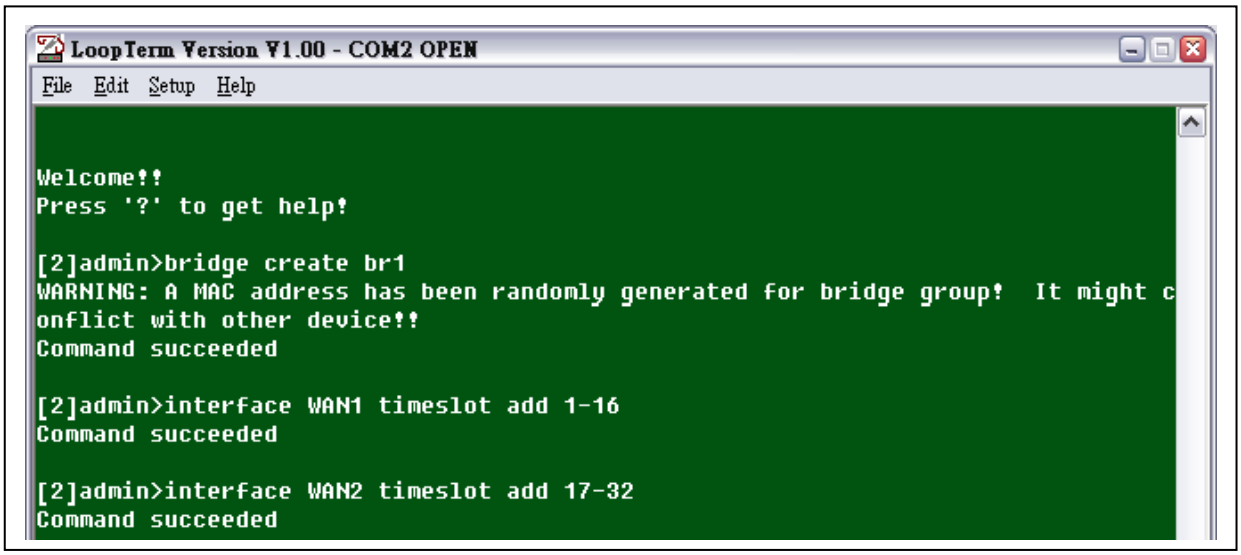
For WAN interface setup, there is WAN1and WAN2 for setting.

Router-B card supports mutiple WAN interfaces. Before configuring each WAN interface, it needs to setup the timeslot map in advance.

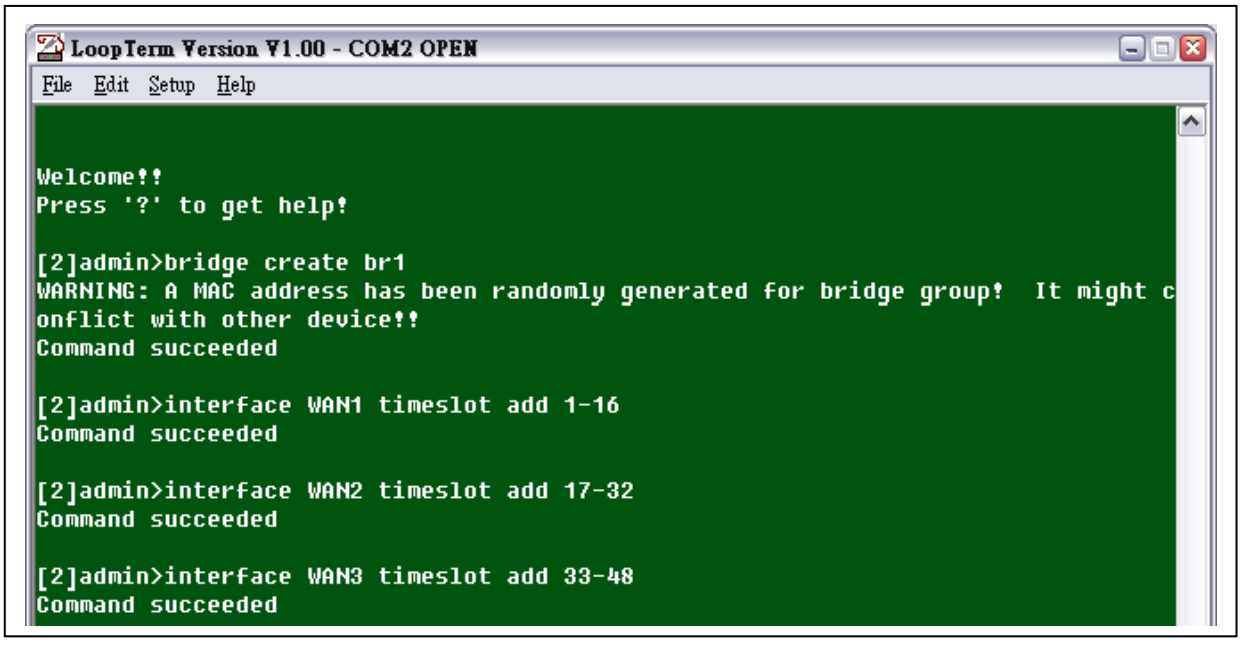
Key in the command **interface WANXX timeslot set** to assgin timeslots to interface WAN1. The following example assigns 16 timeslots to interface WAN1 from timeslot 1 to timeslot 16.



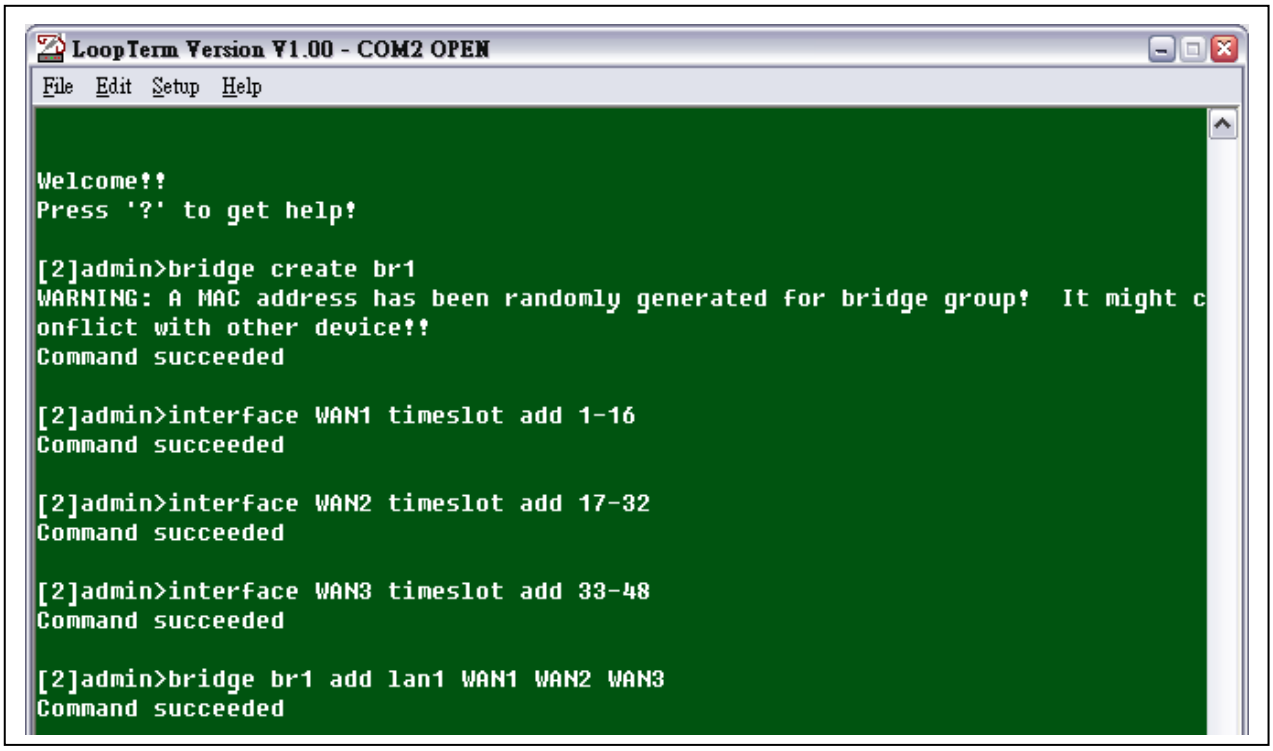
Key in the command **interface WANXX timeslot set** to assgin timeslots to interface WAN2. The following example assigns 16 timeslots to interface WAN2 from timeslot 17 to timeslot 32.



Key in the command **interface WANXX timeslot set** to assgin timeslots to interface WAN3. The following example assigns 16 timeslots to interface WAN3 from timeslot 33 to timeslot 48.



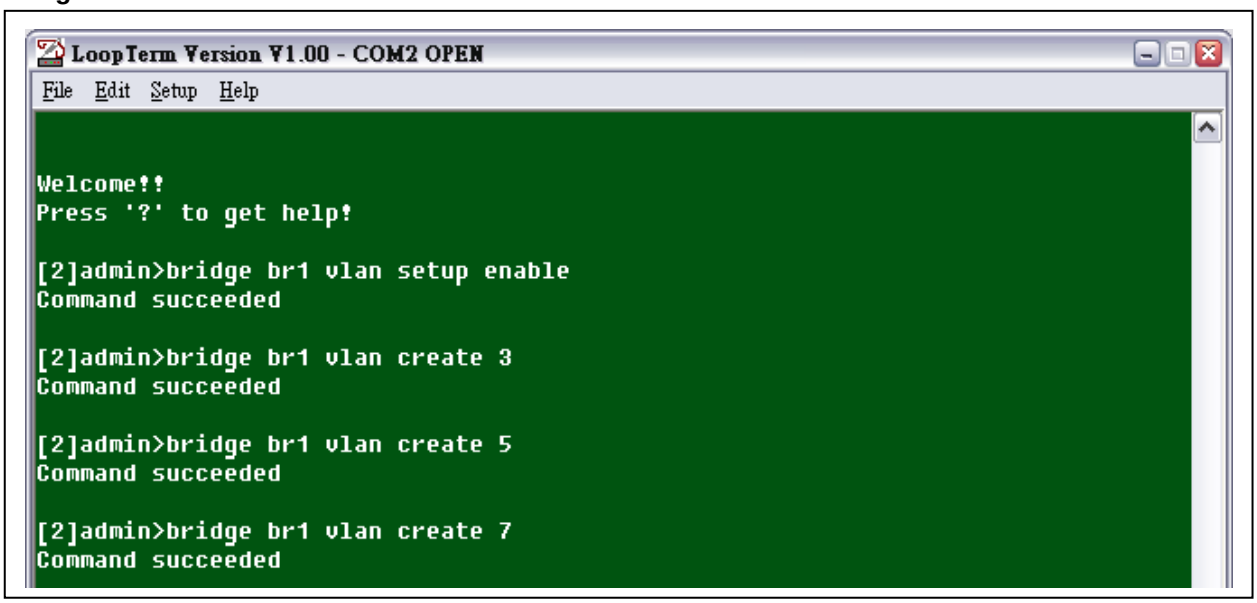
Key in the admin command **bridge br1 add lan1 WAN1 WAN2 WAN3.**



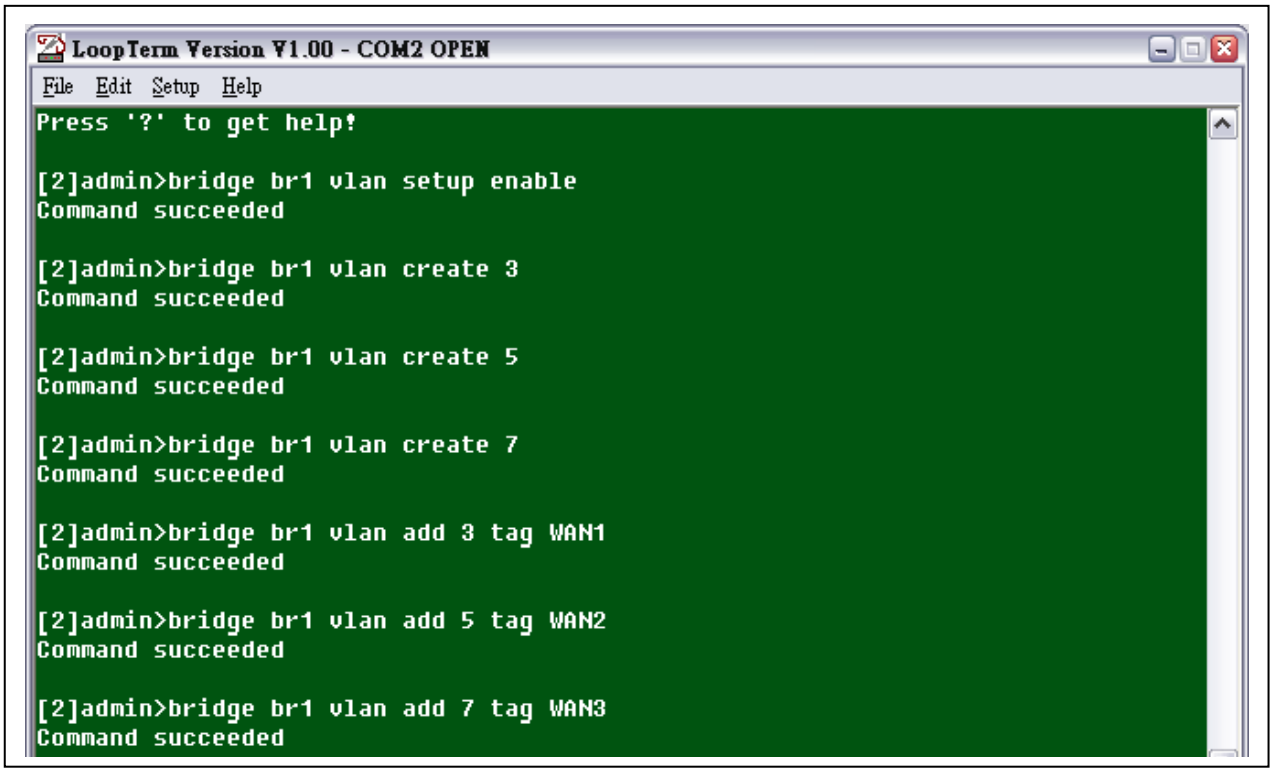
2. VLAN Setup

You must set the VLAN mode. Key in the command **bridge br1 vlan** followed by the parameter you require. In our sample screen we chose to use enable as our parameter.

You must create a VID for each port. To create VID:3 key in the command **bridge br1 vlan create 3** and press Enter. To create VID:5 key in the command **set vlan create 5.** To create VID:7 key in the command **bridge br1 vlan create 7.**

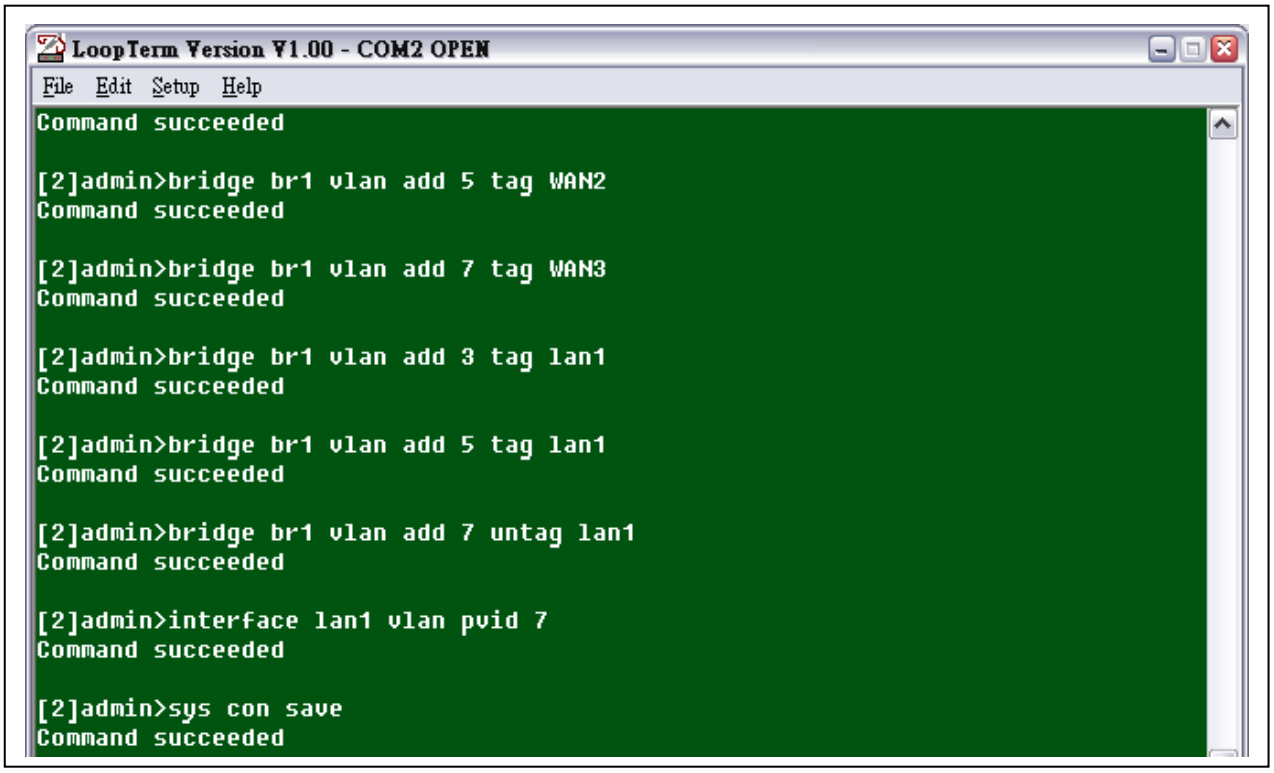


For tagged member of VID:3 VLAN1, key in the command **Bridge br1 vlan add 3 tag WAN1**. Press Enter. For tagged member of VID:5 VLAN2, key in the command **Bridge br1 vlan add 5 tag WAN2**. For tagged member of VID:7 VLAN2, key in the command **Bridge br1 vlan add 7 tag WAN3**.



3. Ethernet Port Setup

You must setup the Ethernet Port to allow it to process VLAN1 (VID:3), VLAN2 (VID:5) and VLAN3 (VID:7) To set LAN1 Ethernet to be a tagged member for VID:3 VLAN1, key in the command **Bridge br1 vlan add 3 tag lan1**. Press Enter. To set LAN1 Ethernet to be a tagged member for VID:5 VLAN2, key in the command **Bridge br1 vlan add 5 tag lan1**. Press Enter. To set LAN1 Ethernet to be an untagged member for VID:7 VLAN3, key in the command **Bridge br1 vlan add 7 untag lan1**. Press Enter. Finally, to set LAN1's PVID to be VID:7, key I the command **interface lan1 vlan pvid 7.**



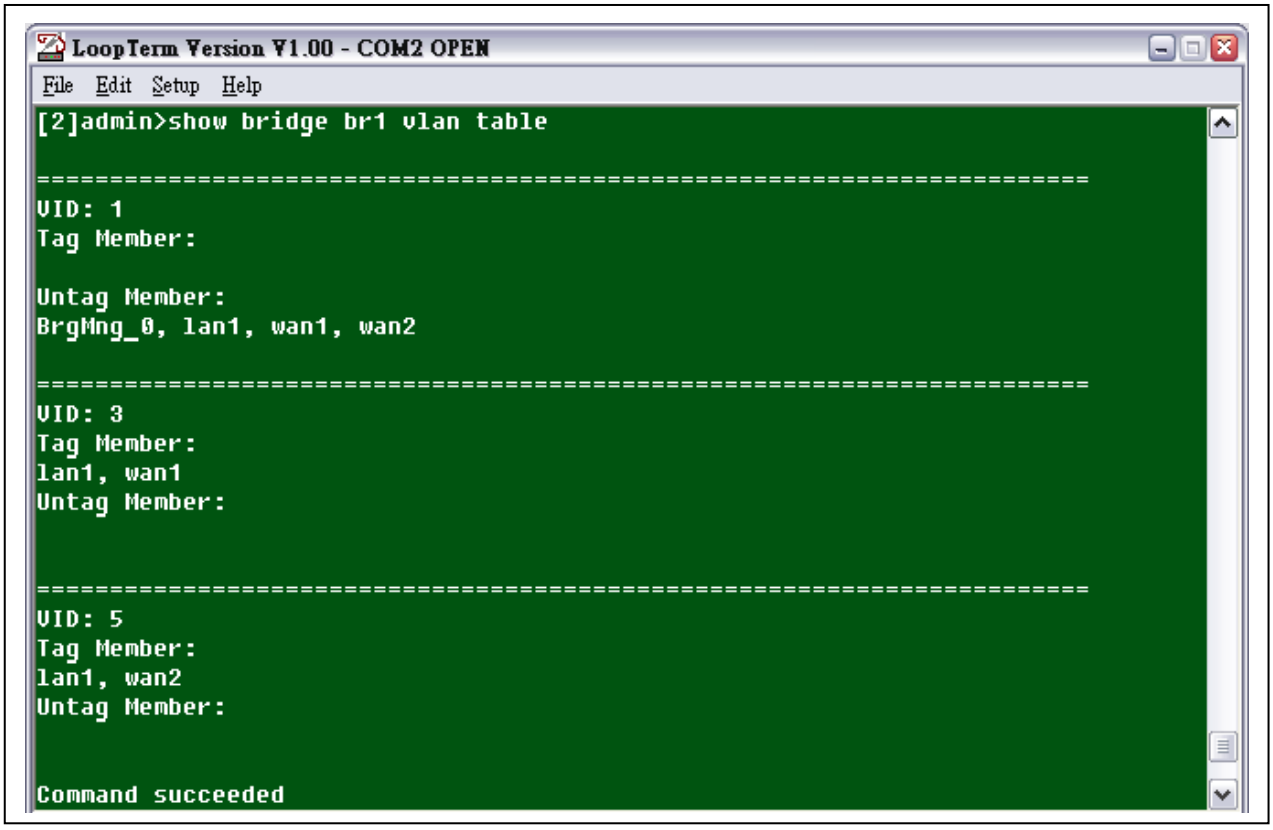
The setup of Application #2 (Figure 16-2) is now complete.

16.3 VLAN and Port Tables

16.3.1 VLAN Table

The "**show bridge br1 vlan table**" command can be used to access the VLAN Table. The VLAN table displays the tagged/untagged member for each VLAN ID. There can be as many as 4094 VLAN IDs. The VID1 appears in the table is automatically generated. The others must be created.

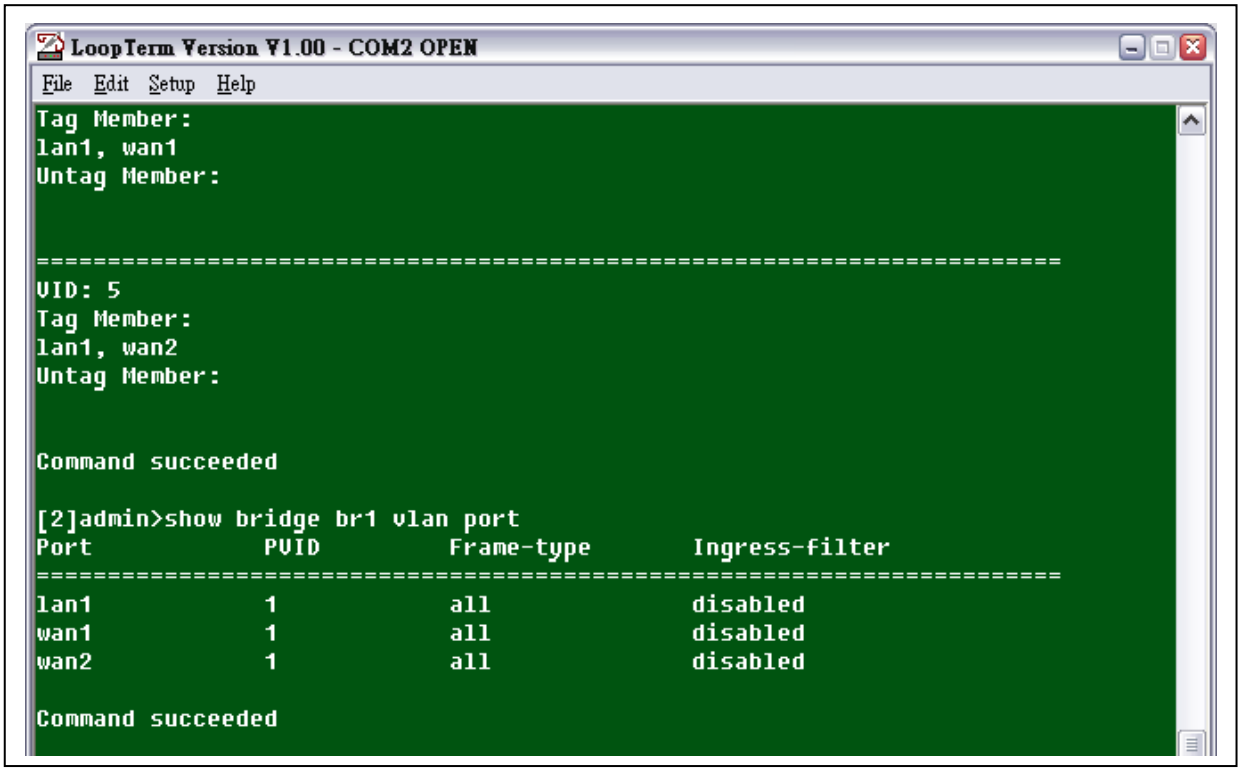
Table 16- 1 VLAN Table



16.3.2 Vlan Port Table

The "**show bridge br1 vlan port**" command can be used to display a port's parameters in the VLAN environment.

Table 16- 2 VLAN Port



17 Setting Up Firmware/Configuration Up/Download with TFTP Server

17.1 Overview

Firmware/Configuration Up/Download functions can be performed with the server on the LAN side (ie. same location as the AM3440) or with the TFTP server on an outside network.

17.2 Upload/Download With The TFTP Server on the LAN Side

Figure 17-1, below illustrates the Router-B card being used in router mode. The TFTP Server is on the LAN side. The IP addresses and gateway addresses used in the diagram correspond to the step by step configuration instructions found in Section 17.3 below.

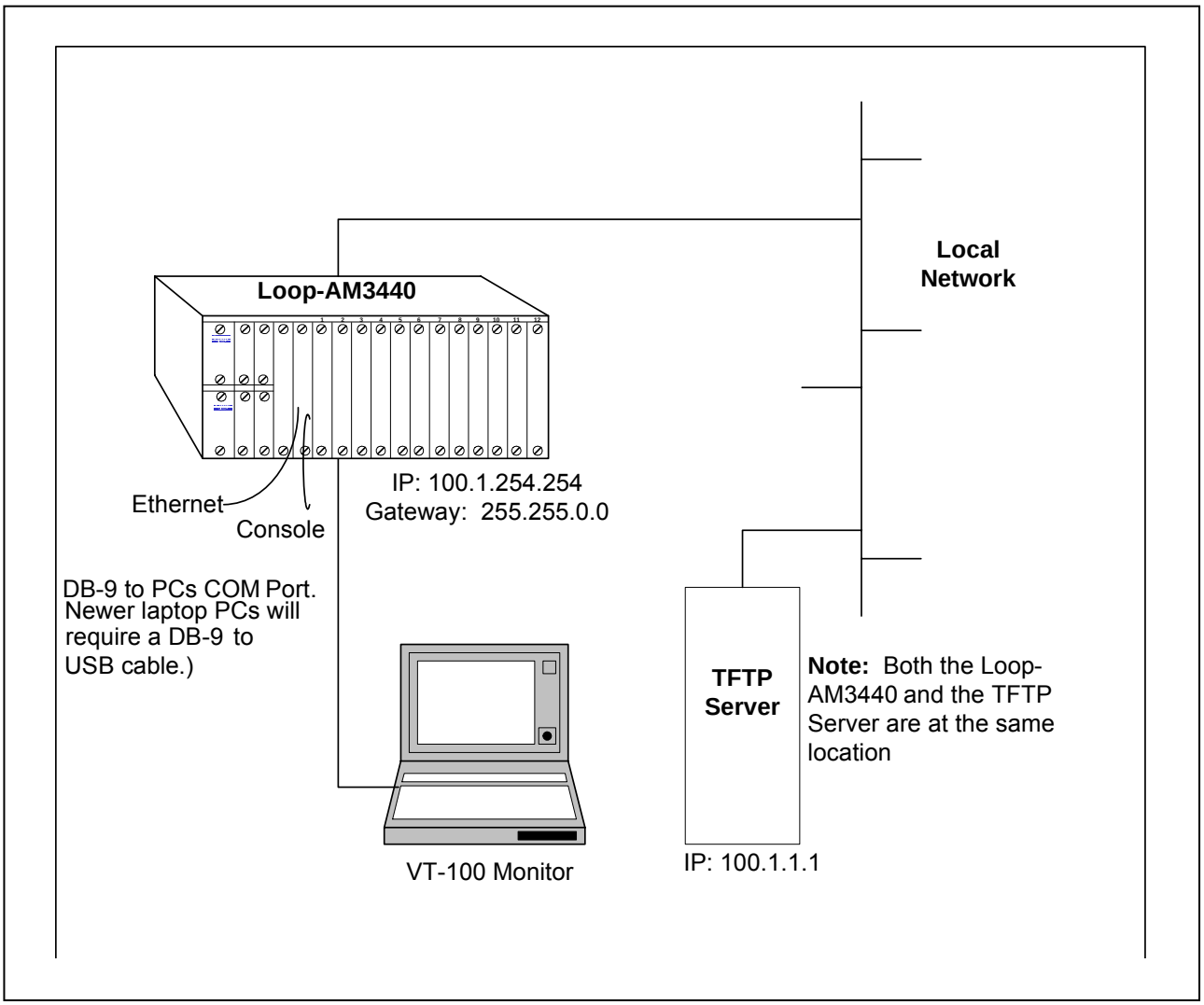


Figure 17- 1 Firmware/Configuration Up/Download with TFTP Server on LAN Side

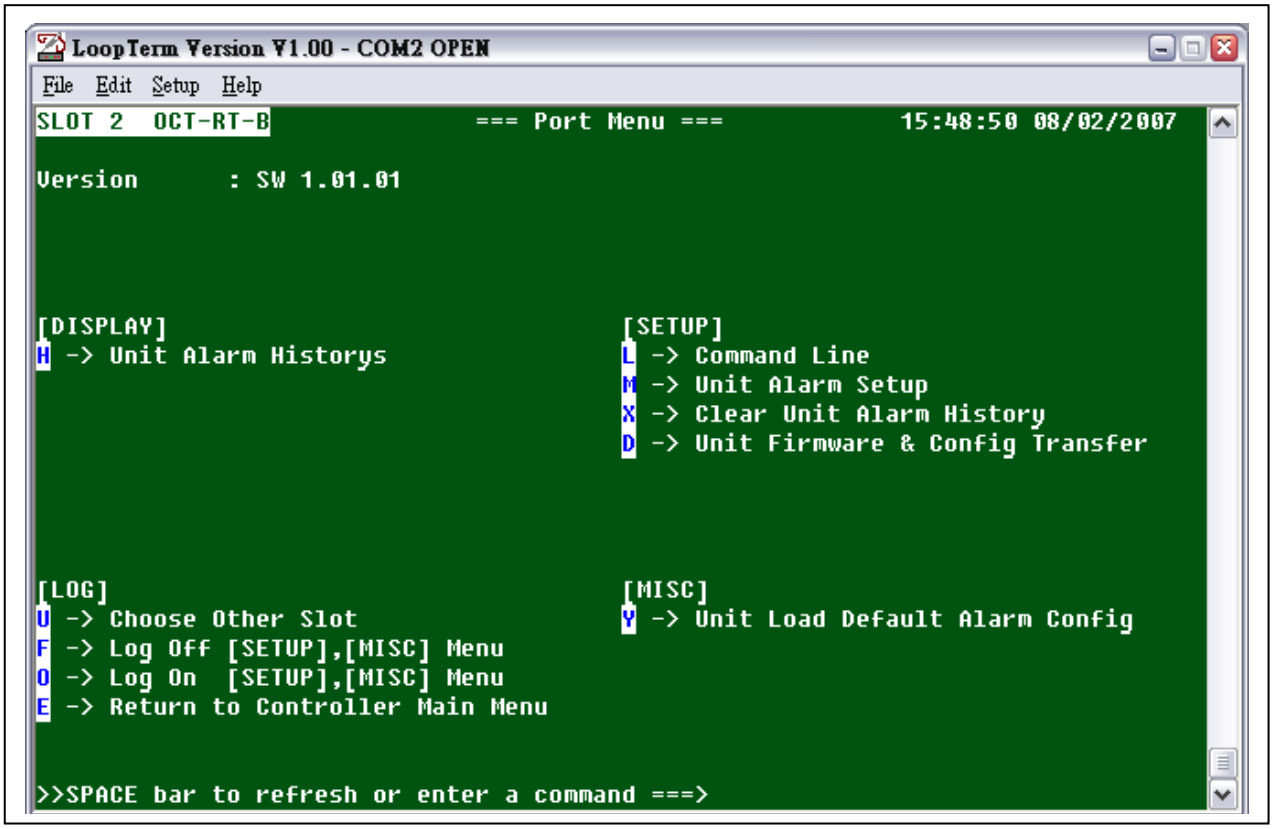
Note: In this application the Router-B card and the TFTP Server are at the same location. Connect a cable between the COM port of your PC and the Console port of the AM3440.

17.2.1 Step by Step Setup Instructions

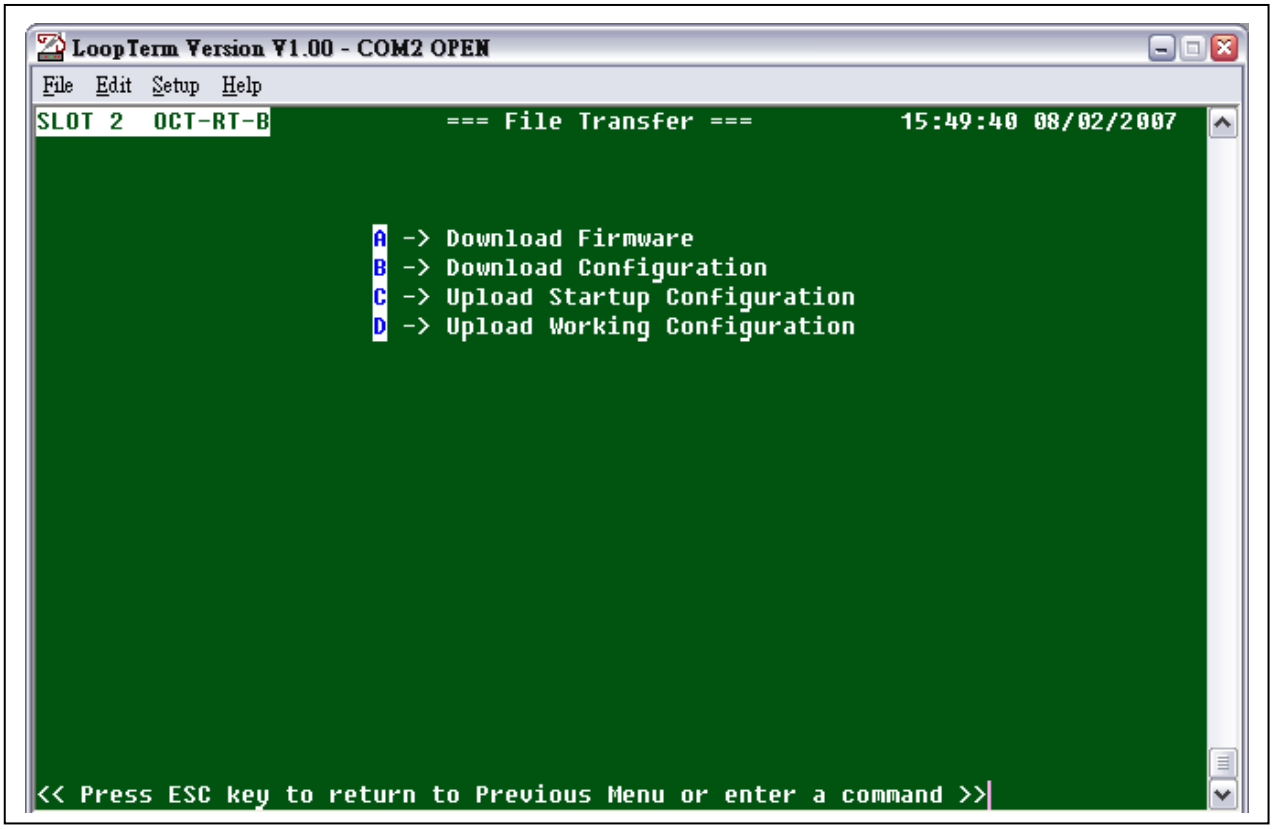
To download firmware proceed to section 17.2.1.2 Firmware Download.
To upload configuration proceed to section 17.2.1.3Configuration Upload.
To download configuration proceed to section 17.2.1.4 Configuration Download.

17.2.1.1 File Transfer

Press “D” from the Router-B main menu to enter into the submen of the File Transfer, as below shows.

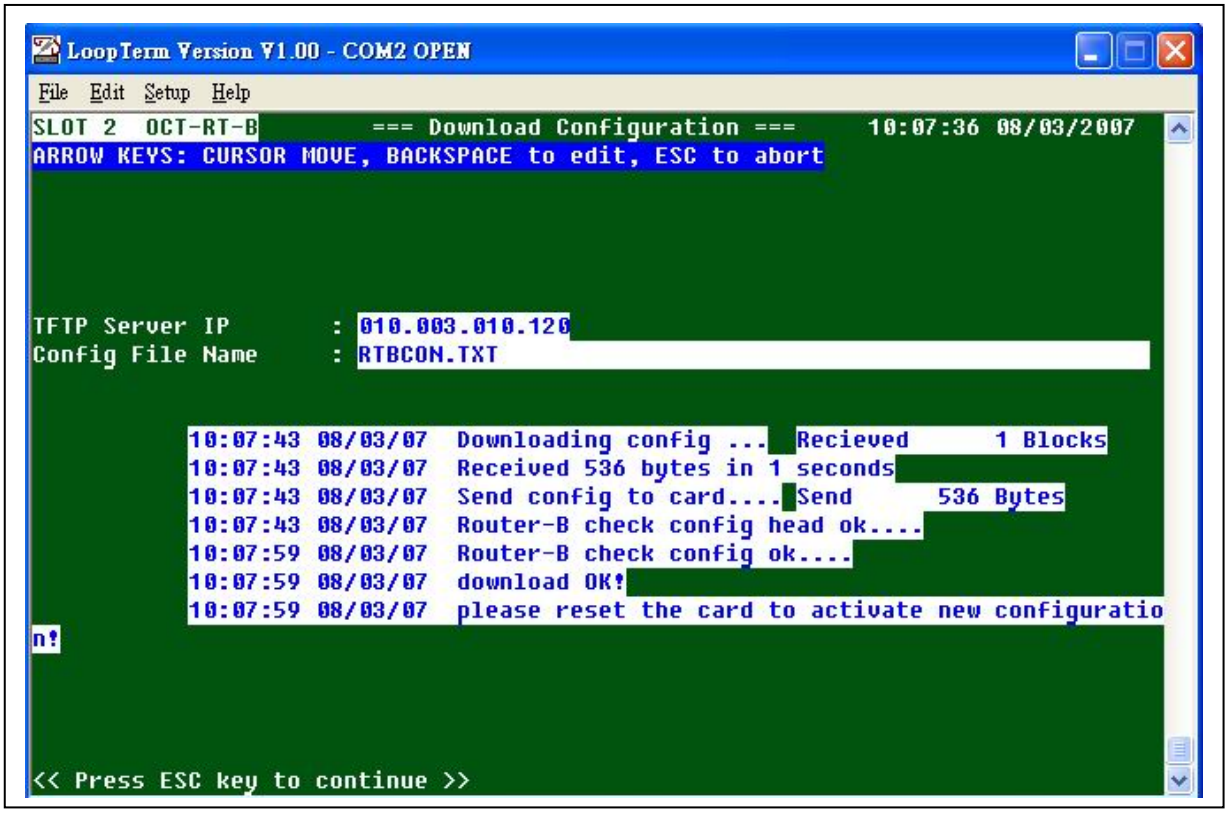


The following screen will appear.



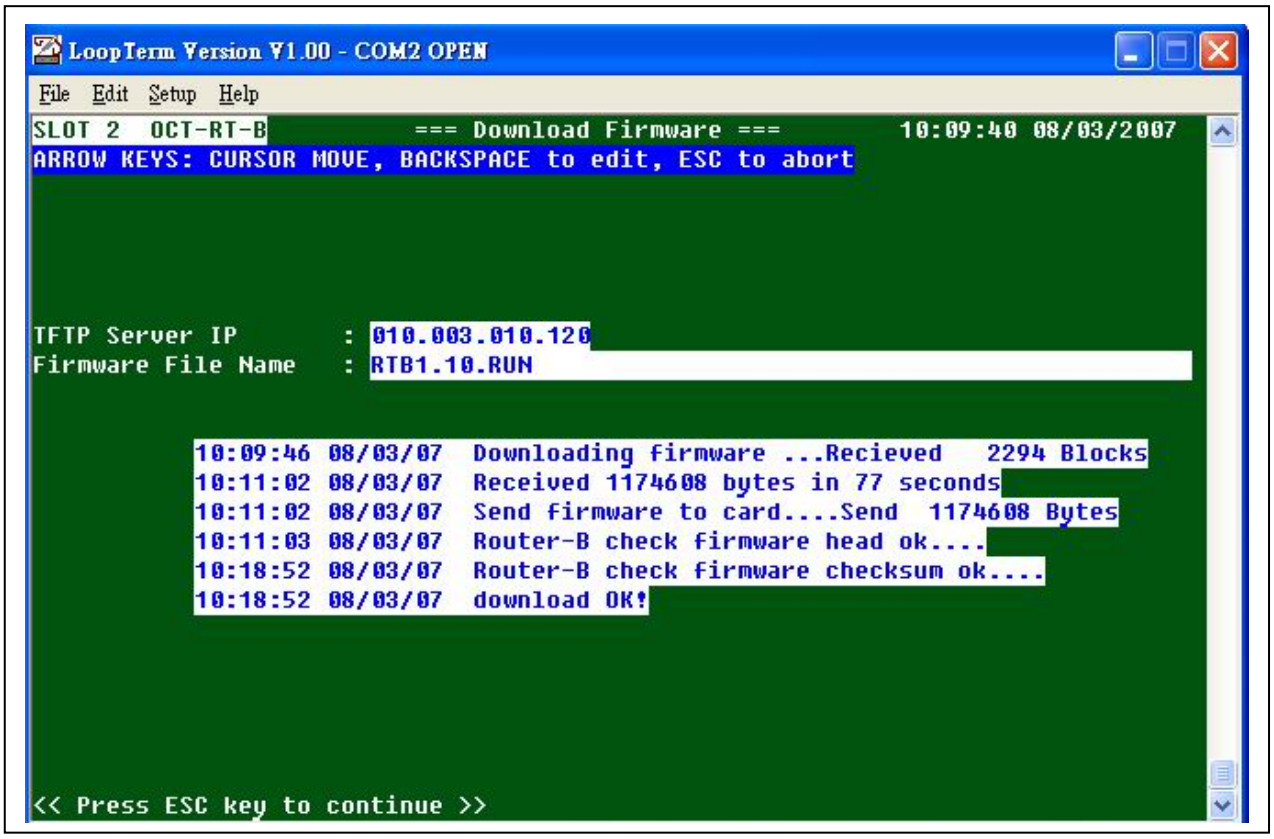
17.2.1.2 Firmware Download

Press “A” from the screen of File Transfer to Download Firmware. Then key in the IP address of the TFTP and the file name. Your screen will tell you how many bytes were transmitted and if the download was successful.



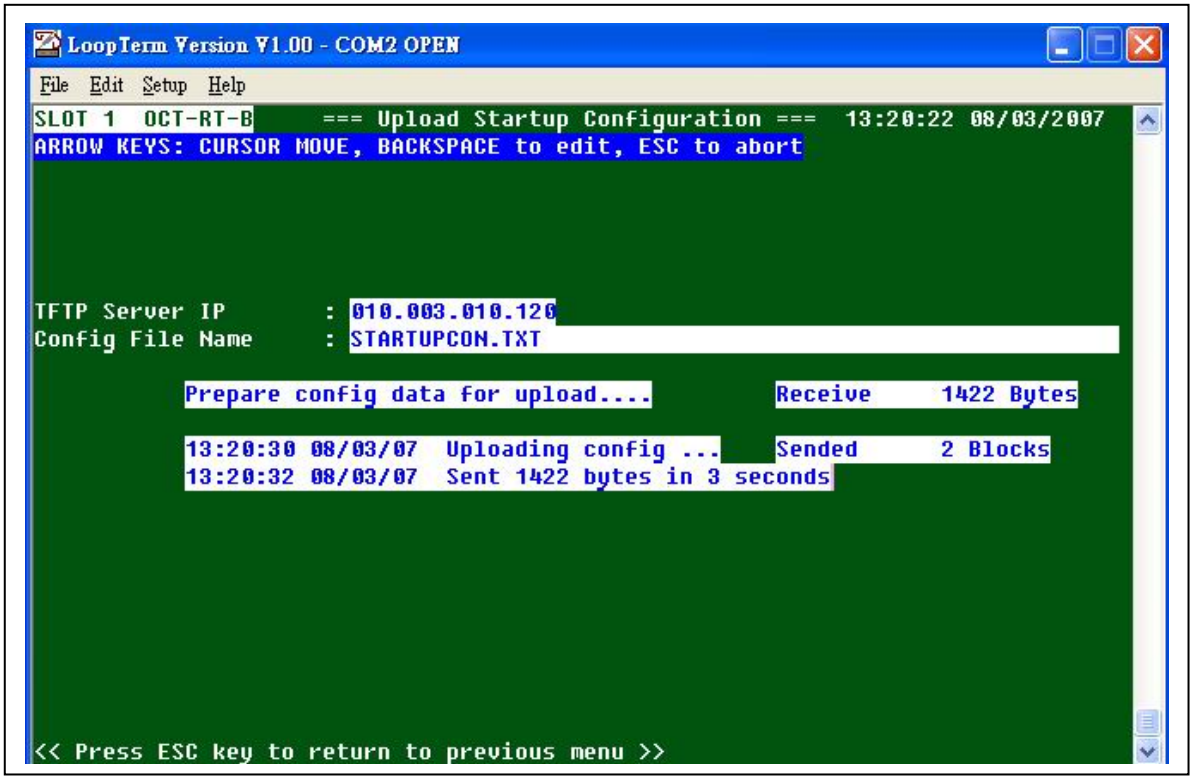
17.2.1.3 Configuration Download

Press “B” from the screen of File Transfer to Download Configuration. Then key in the IP address of the TFTP and the file name Your screen will tell you how many bytes were transmitted and if the download was successful. Before download the configuration, the user have to make sure the Config File Name is exist.



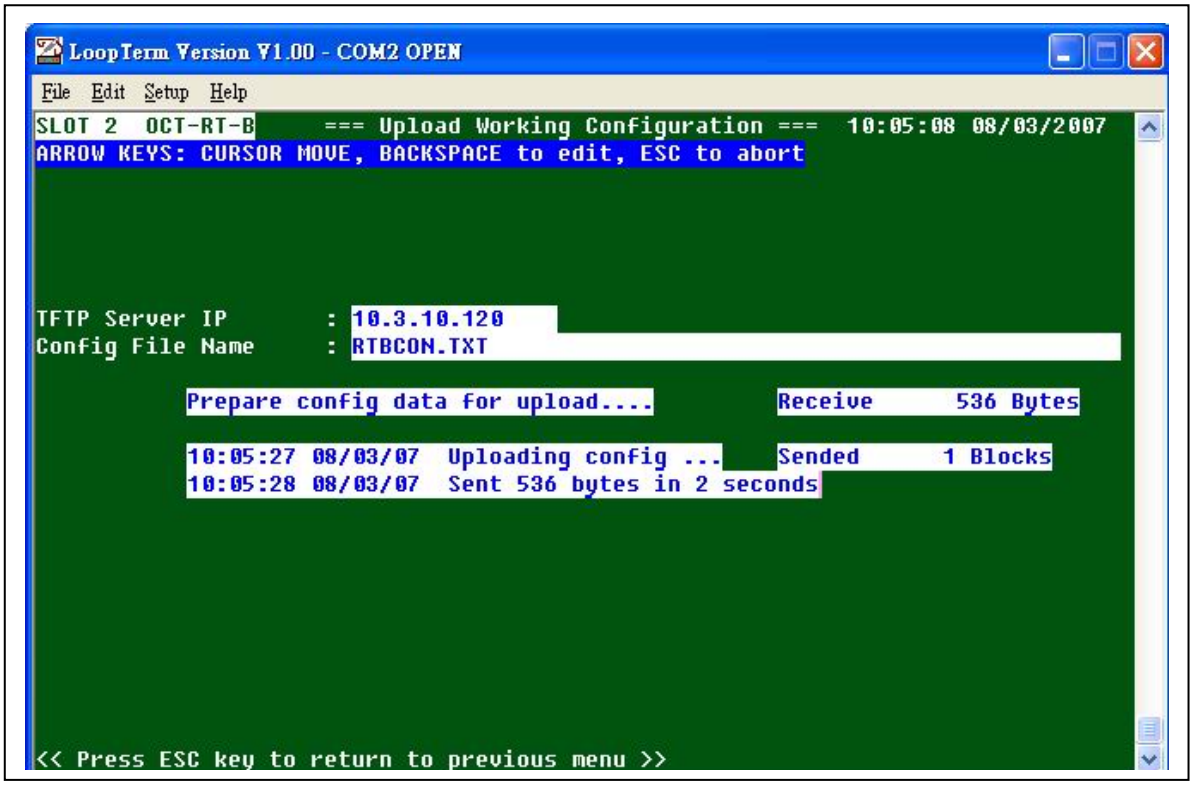
17.2.1.4 Startup Configuration Upload

Press “C” from the screen of File Transfer to Upload Startup Configuration. Then key in the IP address of the TFTP and the file name. Your screen will tell you how many bytes were transmitted and if the upload was successful.



17.2.1.5 Working Configuration Upload

Press “D” from the screen of File Transfer to Upload Working Configuration. Then key in the IP address of the TFTP and the file name Your screen will tell you how many bytes were transmitted and if the download was successful. Before download the configuration, the user have to make sure the Config File Name is exist.



17.3 Upload/Download With The TFTP Server on An Outside Network

Please refer to AM3440 Controller board.

18 Appendix A: OPERATION COMMANDS

This chapter describes the Router-B card configuration options and operational functions. Each command requires a certan user privilege. The Router-B CLI assigns **Admin** a higher privilege than **Operator**. In addition, Command list shows in the end of Chapter 18.

18.1 Ping Command

Command: **ping**
Privilege: operator
Syntax: ping address [-l **packet_size**] [-w **timeout**]
Explanation: Issue ICMP echo packets to a host.
Parameters:

address	The destination address of the ICMP packets.
packet_size	How many bytes to be carried by the ICMP packets. (1 ~ 1500)
timeout	Timeout in milliseconds to wait for each reply (1~5000)

18.2 Traceroute Commands

Command: **traceroute**
Privilege: operator
Syntax: traceroute address [-**l max_hops**] [-w **timeout**]
Explanation: Issue trace route requests
Parameters:

address	The destination address of the ICMP packets.
timeout	Timeout in milliseconds to wait for each reply (1~5000)
max_hops	Maximum number of hops to search for target (1~50)

18.3 Bridge Commands

*In the following commands, please replace "**brg_name"** with the real bridge group name in your system..*

Command: **bridge brg_name add**
Privilege: Admin
Syntax: bridge brg_name add **[interface]**
Explanation: Add interface(s) into the specified bridge group; those interface(s) will be in bridge mode and their router feature will be invalid.
Parameters: **[interface]** name of the interface to be added. If no interface is specified, all the interfaces will be add to the bridge group.

Command: **bridge brg_name age**
Privilege: Admin
Syntax: bridge brg_name age **time**
Explanation: Set maximum age of auto-learned MAC addresses.
Parameters: **time** The maximum age. (in seconds)

Command: **bridge brg_name delete**
Privilege: Admin
Syntax: bridge brg_name delete **[interface]**
Explanation: Remove an interface from a bridge group.
Parameters: **[interface]** name of the interface to be deleted. If no interface is specified, all the interfaces will be deleted from the bridge group.

Command: **bridge brg_name fcs**
Privilege: Admin
Syntax: Bridge brg_name fcs **setting**
Explanation: Enable/disable the original Ethernet frame checksum.
Parameters: **setting** enable/disable

Command: **bridge brg_name ip**
Privilege: Admin
Syntax: bridge brg_name ip **address**
Explanation: Set IP address on the virtual management interface for this bridge group. After setting the ip address, this bridge group can be managed remotely.
Parameters: **address** The management IP. (nnn.nnn.nnn.nnn/prefix)

Command: **bridge brg_name management**
Privilege: Admin
Syntax: bridge brg_name management **enable/diable**
Explanation: Enable/disable bridge management feature.
Parameters: **enable/diable** enable/disable

Command: **bridge brg_name policy mac**
Privilege: Admin
Syntax: bridge brg_name policy mac **direction list_name**
Explanation: With this command, while packets coming in or out of the virtual management interface will be checked and dropped if the mac address(es) matches those in the list.
If a list is binding on "inbound" direction, the source mac address of incoming packets will be checked; if a list is binding on "outbound" direction, the destination mac address of outgoing packets will be checked.
Parameters: **direction** Set inbound or outbound
list_name list name or "off" to disable access control

Command: **bridge brg_name spantree age**

Privilege: Admin
Syntax: bridge brg_name spantree age **value**
Explanation: Sets the maximum age of received protocol information before it is discarded. That is, when this router is the root bridge, if a non-root bridge has not received a hello message within the time period set by maximum age, the non-root bridge assumes that a network failure has occurred and the bridges can begin reconfiguring the network.
Parameters: **value** the maximum age (in seconds) of received protocol information before it is discarded. The possible values range from 6 to 40.seconds. The default value is 20 seconds
Note: The default value of 20 seconds is recommended in the STP/RSTP. If you change this value, the following relationship must be observed: 2 x (Bridge_Forward_Delay – 1.0 seconds) >= Bridge_Max_Age
Bridge_Max_Age >= 2 x (Bridge_Hello_Time + 1.0 seconds)

Command: **bridge brg_name spantree delay**
Privilege: Admin
Syntax: bridge brg_name spantree delay **value**
Explanation: Set a bridge's spanning tree delay value
Parameters: **value** the time in seconds that bridge use for forward delay. The possible valus range from 4 to 30 seconds. The default value is 15 seconds
Note: The default value of 15 seconds is recommended in the STP/RSTP. If you change this value, the following relationship must be observed:
2 x (Bridge_Forward_Delay – 1.0 seconds) >= Bridge_Max_Age

Command: **bridge brg_name spantree hello**
Privilege: Admin
Syntax: bridge brg_name spantree hello **value**
Explanation: This command sets how often (in seconds) the root bridge sends out BPDU hello messages. At any instant in STP/RSTP, one bridge is the root bridge. The root bridge generates a hello message periodically. All other network bridges wait for hello messages. If a bridge does not get a hello message in the expected time, it presumes network malfunctions and notifies other bridges that the network transmission paths must be reconfigured. When this device is the root bridge, all other bridges use this device's hello time value.
Parameters: **value** the time interval for the root bridge sends out BPDU hello messages. The possible value is 1 to 10. The default value is 2 seconds

Note: A hello time value that is too low results in many BPDU hello messages being sent over the network, possibly creating excessive traffic on the network. A value that is too high slows the response to network topology changes. The default value of 2 seconds is recommended in 802.1d/802.1w. If you change this value, the following relationship must be obeyed:
Bridge_Max_Age >= 2 x (Bridge_Hello_Time + 1.0 seconds)

Command: **bridge brg_name spantree priority**
Privilege: Admin
Syntax: bridge brg_name spantree priority **value**
Explanation: Set a bridge's spanning tree priority value.
Sets the priority for specified bridge group. The lower the bridge's priority, the more likely it is to be selected as the root bridge
Parameters: **value** the value can be set from 0 to 65535. The value 0 is the highest priority. Default value is 32768.

Command: **bridge brg_name spantree setup**

Privilege: Admin
Syntax: bridge brg_name spantree setup **setting**
Explanation: Enable/disable spanning tree feature
Parameters: **setting** enable/disable

Command: **bridge brg_name vlan add**
Privilege: Admin
Syntax: bridge brg_name vlan add **vid tag/untag interface**
Explanation: Add one port to be a tagged or untagged member of one created VLAN in a bridge group.
Parameters: **vid** bridge brg_name VLAN ID. Range from 1-4094
tag/untag Tagged port or untagged port
interface Interface Name. (lan1~2/WAN1~WAN64/WANX pvc1-16)

Command: **bridge brg_name vlan create**
Privilege: Admin
Syntax: bridge brg_name vlan create **vid**
Explanation: Except VLAN 1(default VLAN), each VLAN needs to be created before use. This command will create a VLAN in a bridge group.
Parameters: **vid** bridge brg_name VLAN ID. Range from 1-4094

Command: **bridge brg_name vlan delete**
Privilege: Admin
Syntax: bridge brg_name vlan delete **vid tag/untag interface**
Explanation: Delete a tagged or an untagged port from a created VLAN in a bridge group.
Parameters: **vid** bridge brg_name VLAN ID. Range from 1-4094
tag/untag Tagged port or untagged port
interface Interface Name (lan1~2/WAN1~WAN64/WANX pvc1-16)

Command: **bridge brg_name vlan destroy**
Privilege: Admin
Syntax: bridge brg_name vlan destroy **vid**
Explanation: If a created VLAN will not be used, use this command to destroy it. Default VLAN (vid:1) cannot be destroyed.
Parameters: **vid** VLAN ID. Range from 1-4094

Command: **bridge brg_name vlan mgmt**
Privilege: Admin
Syntax: bridge brg_name vlan mgmt **vid**
Explanation: For each bridge group, it will have a interface for management. This interface should belong to one created VLAN. It means only hosts in this VLAN could communicate with the interface. By default, this interface will belong to VLAN 1.
Parameters: **vid** bridge brg_name VLAN ID. Range from 1-4094

Command: **bridge brg_name vlan regencrc**
Privilege: Admin
Syntax: bridge brg_name regencrc **setting**
Explanation: Enable/disable regenerating CRC on WAN interface for bridge brg_name frames.
Parameters: **setting** enable/disable (Default: disabled)
Note: Enable this feature will reduce the performance for bridge forwarding.

Command: **bridge brg_name vlan setup**
Privilege: Admin
Syntax: bridge brg_name vlan setup
Explanation: Enable/disable VLAN Fearure. After enabling the VLAN feature, the default VLAN(vid:1) will be created automatically, and all ports will become untagged members of VLAN 1. If you disable the VLAN feature, the bridge group will become VLAN-unware .
Parameters: **Enable/disable**

Command: **bridge create**
Privilege: Admin
Syntax: bridge create **name [mac]**
Explanation: This command will create a bridge group with a management interface, the virtual interface, which will use the mac address specified. If the MAC address is not specified, a random address will be generated for the bridge group. This generated address might conflict with other device.
Note: The Router-B only supports one bridge group.
Parameters: **name** The bridge group name to be created
[mac] MAC address for this bridge group. If no MAC address is specified, a random address will be generated for the bridge group.

Command: **bridge destroy**
Privilege: Admin
Syntax: bridge destroy name
Explanation: Destroys the specified bridge group. All the interfaces belonging to this bridge group will be removed from this bridge group first.
Parameters: **name** The bridge brg_name group name will be destroyed.

18.4 DHCP Commands

Command: **dhcp relay interface add**
Privilege: Admin
Syntax: Dhcp relay interface add **interface**
Explanation: Add interface(s)/bridge mgmt(s) which the DHCP relay should listen to so that any request from a DHCP client on that interface(s) will be forwarded to the server. If no interface names are specified, it will identify all network interfaces/bridge mgmt interfaces and exclude those interfaces which have no IP address
Parameters: **Interface** lan1/lan2/bridge_group_name

Command: **dhcp relay interface delete**
Privilege: Admin
Syntax: Dhcp relay interface delete **interface**
Explanation: Exclude the interface(s)/bridge mgmt(s) from theDHCP relay so that any request from a DHCP client on that interface(s) will not be forwarded to server
Parameters: **Interface** lan1/lan2/bridge_group_name

Command: **dhcp relay server**
Privilege: Admin
Syntax: Dhcp relay server **address**
Explanation: Set DHCP server IP address to which DHCP and BOOTP requests should be relayed
Parameters: **address** IP address (xxx.xxx.xxx.xxx)

Command: **dhcp relay setup**
Privilege: Admin
Syntax: Dhcp relay setup **setting**
Explanation: Enable/Disable DHCP relay features on the device. Note that DHCP server and relay cannot be enabled simultaneously. Once the relay feature is enabled, any configuration change for the relay will not take affect until the user disables and enables it again
Parameters: **Setting** enable/disable

Command: **dhcp server host add**
Privilege: Admin
Syntax: Dhcp server host add **name**
Explanation: Hosts which require special configuration options can be added by this command. If no address is specified in the following command, the address will be allocated dynamically (if possible), but the host-specific information will still come from the host declaration
Parameters: **Name** unique name of host (<16 bytes)

Command: **dhcp server host delete**
Privilege: Admin
Syntax: Dhcp server host delete **name**
Explanation: Delete the DHCP host so that all configurations for the host will be lost
Parameters: **Name** host name in configuration

Command: **dhcp server host host_name bootfile**
Privilege: Admin
Syntax: Dhcp server host host_name bootfile **filename**
Explanation: Specifies the name of the file that is used as a boot image which is to be loaded by a client from the next-server
Parameters: **filename** bootstrap file name (< 64 bytes) or NULL to remove setting

Command: **dhcp server host host_name client_id**
Privilege: Admin
Syntax: Dhcp server host host_name client_id **id**
Explanation: Sets the DHCP host client identifier. This client id is matched to the actual DHCP or BOOTP client's identifier supplied by the client, or, if the host declaration or the client does not provide a dhcp-client-identifier, by matching the hardware parameter in the host declaration to the network hardware address supplied by the client.
Parameters: **id** client identifier (may be htype/chaddr) or NULL to remove s etting

Command: **dhcp server host host_name fixed_addr**
Privilege: Admin
Syntax: Dhcp server host host_name fixed_addr **address**
Explanation: Sets the DHCP host ip address. The fixed-address command is used to assign one fixed IP addresses to a client
Parameters: **address** IP address (xxx.xxx.xxx.xxx) or NULL to remove setting

Command: **dhcp server host host_name hardware**
Privilege: Admin
Syntax: Dhcp server host host_name hardware **type address**
Explanation: Sets the host hardware type/address. Specifies the MAC address of the client's hardware and the physical hardware interface type in order for a BOOTP client to be recognized
Parameters: **type** ETHERNET/TOKEN-RING/FDDI or NULL to remove setting
address h/w address specific to h/w type

Command: **dhcp server host host_name lease**
Privilege: Admin
Syntax: Dhcp server host host_name lease **time**
Explanation: Sets the DHCP host default duration of the lease; i.e., the duration of the lease for an IP address that is assigned from a DHCP Server to a DHCP client
Parameters: **time** default lease time in secs or NULL to remove setting

Command: **dhcp server host host_name next_server**
Privilege: Admin
Syntax: Dhcp server host host_name next_server **address**
Explanation: Specifies the IP address of the next server in the boot process, which is typically a Trivial File Transfer Protocol (TFTP) server
Parameters: **address** IP address (xxx.xxx.xxx.xxx) or NULL to remove setting

Command: **dhcp server host host_name option**
Privilege: Admin
Syntax: Dhcp server host host_name option **code value**
Explanation: Sets the DHCP host option by code (max 8 options). Apart from the above settings for a host, if the user needs to mention some special configurations, he/she can use this command, but the user needs to take care that the option code and corresponding value are in proper format
Parameters: **code** option code from RFC 2132 (1 to 255)
value option value (< 64 bytes) or NULL to remove setting

Command: **dhcp server interface add**
Privilege: Admin
Syntax: Dhcp server interface add **interface**
Explanation: Add interface(s)/bridge mgmt(s) to the DHCP server. The name of the network interface(s)/ bridge mgmt(s) on which the DHCP server should listen for client's request may be specified by this command line. If no interface names are specified it will identify all network interfaces/bridge mgmt interfaces and exclude those interfaces which have no IP address.
Parameters: **Interface** lan1/lan2/bridge_group_name

Command: **dhcp server interface delete**
Privilege: Admin
Syntax: Dhcp server interface delete **interface**
Explanation: Exclude the interface(s)/bridge mgmt(s) from DHCP server so that any request from a DHCP client on that interface(s) will be ignored by the server
Parameters: **Interface** lan1/lan2/bridge_group_name

Command: **dhcp server setup**
Privilege: Admin
Syntax: Dhcp server setup **setting**
Explanation: Enables/Disables the DHCP server feature on the device. Note that the DHCP server and relay cannot be enabled simultaneously. Once the server is enabled, any configuration change for the server will not take effect until the user disables and enables it again
Parameters: **Setting** enable/disable

Command: **dhcp server subnet add**
Privilege: Admin
Syntax: Dhcp server subnet add **name**
Explanation: Add the DHCP subnetto the server, so that when a request is received from a DHCP client, the server can assign an IP address and other necessary parameters to the client. Note that user must add a subnet for each configured interface on which he/she WANts to run DHCP server
Parameters: **Name** unique name of subnet (<16 bytes)

Command: **dhcp server subnet delete**
Privilege: Admin
Syntax: Dhcp server subnet delete **name**
Explanation: Deletes the DHCP subnet so that all configurations for the subnet will be lost
Parameters: **Name** subnet name in configuration

Command: **dhcp server subnet subnet_name bootfile**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name bootfile **filename**
Explanation: Specifies the name of the file that is used as a boot image which is to be loaded by a client from next-server
Parameters: **filename** bootstrap file name (< 64 bytes) or NULL to remove setting

Command: **dhcp server subnet subnet_name bootp**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name bootp **support**
Explanation: Enables/disables the BOOTP support for the subnet. If enabled, any request from a BOOTP client will be accepted by the DHCP server, otherwise it will be silently discarded.
Parameters: **support** enable/disable

Command: **dhcp server subnet subnet_name dns_server add**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name dns_server add **address**
Explanation: Configures the Domain Name System (DNS) IP servers available to the client. User can add 4 DNS servers by this command. If the DNS server is not configured, the client cannot correlate host names to IP addresses
Parameters: **address** IP address (max 4 address)

Command: **dhcp server subnet subnet_name dns_server delete**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name dns_server delete **address**
Explanation: Deletes the DNS servers already configured
Parameters: **address** ip address or “all” to delete all setting

Command: **dhcp server subnet subnet_name domain_name**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name domain_name **name**
Explanation: Specifies the client's domain name string
Parameters: **name** domain name system (<32 bytes) or NULL to remove setting

Command: **dhcp server subnet subnet_name ip_range**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name ip_range **start_addr end_addr**
Explanation: Specifies the pool of IP addresses in the subnet that can be assigned to DHCP clients. The address pool must be in the same network segment or subnet
Parameters: **start_addr** start IP address or NULL to remove setting
end_addr end ip address

Command: **dhcp server subnet subnet_name lease**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name lease **time**
Explanation: **Set DHCP subnet default duration of lease**
Sets the default duration of a lease for an IP address that is assigned from a DHCP Server to a client
Parameters: **time** default lease time in secs to remove setting

Command: **dhcp server subnet subnet_name nbns add**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name nbns add **address**
Explanation: Specifies the IP address of the NetBIOS WINS name server. This is used to configure NetBIOS Windows Internet Naming Service (WINS) name servers for Microsoft DHCP clients.
Parameters: **address** IP address (max 4 address)

Command: **dhcp server subnet subnet_name nbns delete**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name nbns delete **address**
Explanation: Deletes the NetBIOS WINS name server already configured
Parameters: **address** ip address or “all” to delete all setting

Command: **dhcp server subnet subnet_name netb_type**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name netb_type **type**
Explanation: Specifies the NetBIOS node type for Microsoft DHCP clients. Valid types are:

- B-node Broadcast
- P-node Peer-to-peer
- M-node Mixed
- H-node Hybrid

Parameters: **type** B-node, P-node, M-node or H-node or NULL

Command: **dhcp server subnet subnet_name network**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name network **address**
Explanation: Configures the network number and prefix for a DHCP address pool. The network-number/prefix uniquely identifies the subnet so that DHCP server first identifies the subnet from a client request it receives, and assigns a IP address from that subnet address pool
Parameters: **address** subnet IP address (xxx.xxx.xxx.xxx/xx) or NULL to remove setting

Command: **dhcp server subnet subnet_name next_server**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name next_server **address**
Explanation: Specifies the IP address of the next server in the boot process, which is typically a Trivial File Transfer Protocol (TFTP) server
Parameters: **address** IP address (xxx.xxx.xxx.xxx) or NULL to remove setting

Command: **dhcp server subnet subnet_name option**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name option **code value**
Explanation: Sets DHCP options by code (max 8 options). Apart from the above settings for a host, if the user needs to mention some special configurations, he/she can use this command, but the user needs to take care the option code and corresponding value are in the proper formats.
Parameters: **code** option code from RFC 2132 (1 to 255)
value option value (<64 bytes) or NULL to remove setting

Command: **dhcp server subnet subnet_name router add**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name router add **address**
Explanation: Specifies the IP address of the default router in the subnet
Parameters: **address** IP address (max 4 address)

Command: **dhcp server subnet subnet_name router delete**
Privilege: Admin
Syntax: Dhcp server subnet subnet_name router delete **address**
Explanation: Deletes the router for the subnet already configured
Parameters: **address** IP deleteress (max 4 deleteress)

18.5 Interface Commands

The interface commands are always associated with an interface name (ex. interface lan1). Following commands use **ifname** to represent an interface name.

Command: **interface ifname alias add**
Privilege: Admin
Syntax: Interface ifname alias add **address**
Explanation: Adds an alias IP address. This command allows multiple IP addresses can be assigned to an interface. A maximum of 5 alias IP address are supported
Parameters: **address** IP address (xxx.xxx.xxx.xxx/xx)

Command: **interface ifname alias delete**
Privilege: Admin
Syntax: Interface ifname alias delete **address**
Explanation: Deletes alias IP address
Parameters: **address** IP address (xxx.xxx.xxx.xxx/xx)

Command: **interface ifname ip**
Privilege: Admin
Syntax: interface ifname ip **address**
Explanation: Sets an interface's IP address.
Parameters: **address** The IP address. (xxx.xxx.xxx.xxx/xx)

Command: **interface ifname policy acl**
Privilege: Admin
Syntax: Interface ifname policy acl **direction list_name**
Explanation: Sets access control for router interface. Not valid for interfaces in bridge mode.
If a list is binding on the "inbound" direction, all incoming packets to this interface will be checked with the entries in the list; if a list is binding on the "outbound" direction, all outgoing packets from this interface will be checked.
Parameters: **direction** Set inbound or outbound
list_name list_name or "off" to disable access control

Command: **interface ifname policy mac**
Privilege: Admin
Syntax: Interface ifname policy mac **direction list_name**
Explanation: Sets access control for the bridge interfaces. Not valid for interfaces in router mode.
Packets coming in or out of the virtual management interface, will be checked and dropped if the mac address(s) matches those in the list.
If a list is binding on the "inbound" direction, the source mac address of all incoming packets to this interface will be checked with the entries in the list; if a list is binding on the "outbound" direction, the destination mac address of all outgoing packets from this interface will be checked.
Parameters: **direction** Set inbound or outbound
list_name List name or "off" to disable access control

Command: **Interface ifname route ospf auth-key message-digest-key**
Privilege: Admin
Syntax: interface ifname route ospf auth-key message-digest-key
Explanation: Set OSPF MD5 authentication key. Assign a password to be used by neighboring OSPF routers on a network segment that is using OSPF's MD5 password authentication.
Parameters:

Command: **Interface ifname route ospf auth-key text-key**
Privilege: Admin
Syntax: interface ifname route ospf auth-key text-key
Explanation: Set OSPF text format authentication key. Assign a password to be used by neighboring OSPF routers on a network segment that is using OSPF's simple password authentication.
Parameters:

Command: **Interface ifname route ospf cost**
Privilege: Admin
Syntax: interface ifname route ospf cost **value**
Parameters: **value** the number of seconds to wait before sending another packet (Valid values are 1 to 65535)

Command: **Interface ifname route ospf dead**
Privilege: Admin
Syntax: interface ifname route ospf dead **value**
Explanation: Set the number of seconds that a device's hello packets must not have been seen before its neighbors declare the OSPF router down. This value must be the same for all routers attached to a common network. The default value is 40 seconds.
Parameters: **value** the number of seconds to wait before sending another packet (Valid values are 1 to 65535)

Command: **Interface ifname route ospf hello**
Privilege: Admin
Syntax: interface ifname route ospf hello **value**
Explanation: Set the number of seconds between hello packets sent on an OSPF interface. This value must be the same for all routers attached to a common network. The default value is 10 seconds.
Parameters: **value** the number of seconds to wait before sending another packet (Valid values are 1 to 65535)

Command: **Interface ifname route ospf prior**
Privilege: Admin
Syntax: interface ifname route ospf prior **value**
Explanation: Set priority to help determine the OSPF designated router for a network. By setting a higher value, the router will be more eligible to become the Designated Router. By setting the value to 0, the router will no longer be eligible to be the Designated Router. The default value is 1.
Parameters: **value** (Valid values are 0 to 255)

Command: **Interface ifname route ospf retransmit**
Privilege: Admin
Syntax: interface ifname route ospf retransmit **value**
Explanation: Specify the number of seconds between link state advertisement retransmissions for adjacent OSPF routers linked to this interface. This value is used when re-transmitting Database Description and Link State Request packets. The default value is 5 seconds.
Parameters: **value** the number of seconds to wait before sending another packet (Valid values are 1 to 65535)

Command: **Interface ifname route ospf transmit**
Privilege: Admin
Syntax: interface ifname route ospf transmit **value**
Explanation: Set the estimated number of seconds it takes to transmit a link state update packet on an OSPF interface. The LSAs' age should be incremented by this value when transmitting. The default value is 1 second.
Parameters: **value** the number of seconds to wait before sending another packet (Valid values are 1 to 65535)

Command: **Interface ifname route ospf setup**
Privilege: Admin
Syntax: interface ifname route ospf setup **setup [area_id]**
Explanation: Enable/Disable OSPF for a specified interface
Parameters: **setup** enable/disable
[area_id] 0~4294967295

Command: **interface ifname route rip setup**
Privilege: Admin
Syntax: interface ifname route rip setup **setting**
Explanation: Enables/disables the RIP routing protocol
Parameters: **setting** Enable/disable.

Command: **interface ifname route rip version**
Privilege: Admin
Syntax: interface ifname route rip version **setting**
Explanation: Configure RIP routing protocol version
Parameters: **setting** Version number. (1/2)

Command: **interface ifname spantree cost**
Privilege: Admin
Syntax: interface ifname spantree cost **value**
Explanation: Sets port cost for spanning tree
Parameters: **value** cost value. Assign lower number to faster media (1-65535)

Command: **interface ifname spantree edge_port**
Privilege: Admin
Syntax: interface ifname spantree edge_port **setting**
Explanation: Enable/disable edge-port feature. This indicates that this port/interface is known to be on the edge of a bridged LAN.
Parameters: **setting** enable/disable

Command: **interface ifname spantree link_type**
Privilege: Admin
Syntax: interface ifname spantree link_type **type**
Explanation: Sets link type in the following three ways.
Parameters: **type** type of link (auto/p-to-p/shared)
- auto: The switch will auto detect the link type. (This is the default value)
- p-to-p: The link is a point-to-point link to another device.
- shared: The link is a shared segment and can contain more than one device.

Command: **interface ifname spantree priority**
Privilege: Admin
Syntax: interface ifname spantree priority **value**
Explanation: Sets a spanning tree priority for a port, which will be used to break the tie when two (or more) ports connected to the same bridge towards the root bridge tie for position as the root port. The port with the lowest port priority will be forwarded (become the root port) and the other port(s) will blocked (become the alternate port).
Parameters: **value** port priority (0-255). Default value is 128.

Command: **interface ifname vlan frame-type**
Privilege: Admin
Syntax: interface ifname vlan frame-type **type**
Explanation: Sets the acceptable frame type of a given interface. Two options con be chosen: all means this interface could accept tagged, untagged or pure-priority packets; tag-only means this interface could only accept tagged packets.
Parameters: **type** all/tag-only

Command: **interface ifname vlan ingress-filter**
Privilege: Admin
Syntax: interface ifname vlan ingress-filter **setting**
Explanation: Enables/disables ingress filtering of a given interface. If enabled, it will check whether the incoming packet belongs to the VLAN which the interface belongs to. If not, it discards the packet.
Parameters: **setting** enabled/disabled

Command: **interface ifname vlan pvid**
Privilege: Admin
Syntax: interface ifname vlan pvid **vid**
Explanation: Sets an Interface's PVID. This PVID will be used in port-based VLAN.
Parameters: **vid** VLAN ID(range from 1 to 4094)

Command: **interface ifname chdlc**
Privilege: Admin
Syntax: interface ifname chdlc **interval timeout**
Explanation: Sets Cisco HDLC Parameters
Parameters: **interval** Keep-alive interval (1-3600, default is 10 secs)
timeout Interface restart timeout (seconds, should be multiple of interval)

Command: **interface ifname encapsulation**
Privilege: Admin
Syntax: interface ifname encapsulation **protocol**
Explanation: Sets layer2 encapsulation protocol
Parameters: **protocol** Layer 2 encapsulation (hdlc/ppp/chdlc/frame_relay)

Command: **interface ifname frame-relay**
Privilege: Admin
Syntax: interface ifname frame-relay **lmi_type [n391 value] [n392 value] [n393 value] [t391 value]**
Explanation: Sets Frame Relay LMI parameters
Parameters: **lmi_type** Frame Relay LMI protocol (ansi/q933)
[n391 value] LMI full-status polling interval (1~255)
[n392 value] LMI error threshold (1~10)
[n393 value] LMI monitored event threshold (1~10)
[t391 value] LMI link integrity polling interval (5~30)

Command: **interface ifname nway auto**

Privilege: Admin
Syntax: interface ifname nway auto
Explanation: Enables auto negotiation to set up link speed/duplex.
Parameters: **none**

Command: **interface ifname nway force**
Privilege: Admin
Syntax: interface ifname nway force **speed duplex**
Explanation: Force mode to set up link speed and duplex.
Parameters: **speed** 10/100
duplex full/half

Command: **interface ifname timeslot add**
Privilege: Admin
Syntax: interface ifname timeslot **add timeslot**
Explanation: Add more timeslots to original setting
Parameters: **timeslot** - Timeslot number (1~128)

Command: **interface ifname timeslot delete**
Privilege: Admin
Syntax: interface ifname timeslot **delete timeslot**
Explanation: Delete some time slots from original setting
Parameters: **timeslot** - Timeslot number (1~128)

Command: **interface ifname timeslot set**
Privilege: Admin
Syntax: interface ifname timeslot **set timeslot**
Explanation: set new timeslots setting regardless of original setting
Parameters: **timeslot** - Timeslot number (1~128), 0 to clear.

Command: **interface ifname tci**
Privilege: Admin
Syntax: interface ifname **tci value**
Explanation: set TCI value to switch
Parameters: **value – tci (1~65535)**

18.6 NAT Commands

Command: **interface ifname napt setup**
Privilege: Admin
Syntax: interface ifname napt setup **setting**
Explanation: Enables/disables the Network Address Port Translation
Parameters: **setting** enable/disable

Command: **interface ifname napt static add**
Privilege: Admin
Syntax: interface ifname napt static add **name lo_port [hi_port] private_addr**
Explanation: Adds an entry into the static port forwarding list
Parameters: **name** The entry name
lo_port The starting port number
[hi_port] The ending port number
private_addr The IP address of the server offering the services (xxx.xxx.xxx.xxx)

Command: **interface ifname napt static delete**
Privilege: Admin
Syntax: interface ifname napt static delete **name**
Explanation: Deletes entries from thestatic port forwarding list
Parameters: **name** The entry name

Command: **interface ifname nat address add**
Privilege: Admin
Syntax: interface ifname nat address add **index start_addr [end_addr]**
Explanation: Adds a pool of public IP addresses for NAT
Parameters: **index** The pool index (1 ~ 8)
start_addr The starting IP address
[end_addr]The ending IP address

Command: **interface ifname nat address delete**
Privilege: Admin
Syntax: interface ifname nat address delete **index**
Explanation: Deletes a pool of public IP addresses for NAT
Parameters: **index** The pool index (1 ~ 8)

Command: **interface ifname nat setup**
Privilege: Admin
Syntax: interface ifname nat setup **setting**
Explanation: Enables/disables Network Address Translation
Parameters: **setting** enable/disable

Command: **interface ifname nat static add**
Privilege: Admin
Syntax: interface ifname nat static add **public_addr private_addr**
Explanation: Adds a static NAT map
Parameters: **public_addr** The public IP address
private_addr The private IP address

Command: **interface ifname nat static delete**
Privilege: Admin
Syntax: interface ifname nat static delete **public_addr**
Explanation: Deletes entries from the NAT static list
Parameters: **public_addr** The public IP address to be deleted

Command: **interface ifname pvc1 dlci**
Privilege: Admin
Syntax: interface ifname pvc1 dlci **DLCI [CIR] [Bc] [Be] [Qdepth]**
Explanation: Sets/deletes a Frame Relay PVC.
Parameters:

DLCI	The PVC's DLCI (0/16~991). The parameter specifies DLCI of the PVC in the WAN link. DLCI=0 will delete the PVC from the bearer channel.
[CIR]	Committed Information Rate (kbps). This specifies how much bandwidth will be provided by the PVC. It can not be greater than physical bandwidth of the WAN link.
[Bc]	Committed Burst Size (kbits). The Router-B computes graduation of bandwidth calculation by this parameter and CIR. The calculation graduaton is (CIR/Bc) seconds.
[Be]	Excess Burst Size (kbits)
[Qdepth]	Max. queue length. When the PVC can offer enough bandwidth for user traffic, it buffers the exceeded packets in internal queue. This parameter specifies maximum number of packets can be put in the buffer. When the queue length exceeds the limit all packets coming later will be dropped.

Command: **interface ifname queue**
Privilege: Admin
Syntax: interface ifname queue **method parameter**
Explanation: Sets output queue management method
Parameters:

method	Management method (tb/sfq)
parameter	Discipline paramters

18.7 Policy Command

Command: **policy acl create**
Privilege: Admin
Syntax: policy acl create **name**
Explanation: Creates an access control list with a given name. This list is combined with several rules and those rules will be checked accordingly.
A maximum of 64 lists can be created.
Parameters: **name** list_name (<6 bytes)

Command: **policy acl destroy**
Privilege: Admin
Syntax: policy acl destroy **name**
Explanation: Destroys the specified access control list. Those rules in the list will disappear.
Parameters: **name** list_name in configuration

Command: **policy acl list1 append**
Privilege: Admin
Syntax: policy acl list1 append **action selector**
Explanation: Appends an entry on the specified list. If a packet matches the selector described in the rule, action will be taken.
A maximum of 32 entries can be added to a list.
Parameters: **action** { permit | deny }
selector "[src_ip/prefix] [dst_ip/prefix] [protocol] [service]"

Command: **policy acl list1 delete**
Privilege: Admin
Syntax: policy acl list1 delete **start_index [end_index]**
Explanation: Deletes entry(s) by indicating the index number.
The rule in the back will follow the procedure to move forward step by step.
Parameters: **start_index** The starting index number. 0 to delete all rules in the list.
[end_index] The end index number

Command: **policy mac create**
Privilege: Admin
Syntax: policy mac create **name**
Explanation: Creates an access control list for mac address. This list is used only for interfaces in bridge mode.
Maximum 6 lists can be created.
Parameters: **name** list_name (<6 bytes)

Command: **policy mac destroy**
Privilege: Admin
Syntax: policy mac destroy **name**
Explanation: Destroys an access control list for mac address
Parameters: **name** list_name in configuration

Command: **policy mac mac_list append**
Privilege: Admin
Syntax: policy mac mac_list append **selector**
Explanation: Adds a MAC address to be blocked to a specified list
Maximum 32 entries can be added for a list.
Parameters: **selector** "XX : XX : XX : XX : XX : XX"

Command: **policy mac mac_list delete**
Privilege: Admin
Syntax: policy mac mac_list delete **selector**
Explanation: Deletes a MAC address from a specified list
Parameters: **selector** "XX : XX : XX : XX : XX : XX"

Command: **policy qos rate_limit append**
Privilege: Admin
Syntax: policy qos rate_limit append **src_ip dest_ip protocol [src_port] [dst_port] [dscp]**
Explanation: Append a traffic control policy
Parameters: **src_ip** any | source IP address/prefix
dest_ip any | destination IP address/prefix
protocol tcp | udp | icmp | any | 0~255
[src_port] any | min[-max] only for TCP/UDP
[dest_port] any | min[-max] only for TCP/UDP
[dscp] Optional Diffserv code point value(s) in decimal, starts with keyword dscp i.e. dscp val1 val2-val3 val4...space to separate DSCP values, but no space for action_parameter rate type rate Committed access rate in min[-max] format type of bandwidth for rate in bits per sec

Command: **policy qos rate_limit delete**
Privilege: Admin
Syntax: policy qos rate_limit delete policy num
Explanation: Delete a traffic control policy
Parameters: policy_num – policy index, starts from 1

Command: **policy qos rate_limit insert**
Privilege: Admin
Syntax: policy qos rate_limit insert **policy num src_ip del_ip protocol [scr_port] [del_port] [dscp]**
Explanation: Insert a traffic control policy
Parameters: **policy_num** Policy index before which new policy will be inserted selector
src_ip dest_ip protocol [src_port] [dst_port] [dscp]
src_ip any | source IP address/prefix
dest_ip any | destination IP address/prefix
protocol tcp | udp | icmp | any | 0~255
[src_port] any | min[-max] only for TCP/UDP
[dest_port] any | min[-max] only for TCP/UDP
[dscp] Optional Diffserv code point value(s) in decimal, starts with keyword 'dscp' i.e. dscp val1 val2-val3 val4...space to separate DSCP values action_parameter rate type rate Committed access rate in min[-max] format type kbps | mbps type of bandwidth for rate in bits per sec

18.8 Route Commands

Command: **route ospf area add**
Privilege: Admin
Syntax: route ospf area add **area_id**
Explanation: Add an OSPF area
Parameters: **area_id**

Command: **route ospf area authentication**
Privilege: Admin
Syntax: route ospf area authentication **area_id type**
Explanation: Enable authentication for an OSPF area
Parameters: **area_id** 0~4294967295
type null | password |md5

Command: **route ospf area cost**
Privilege: Admin
Syntax: route ospf area cost **area_id cost**
Explanation: Assign a specific cost to the default summary route used.
Parameters: **area_id** 0~4294967295
cost 0~16777215

Command: **route ospf area delete**
Privilege: Admin
Syntax: route ospf area delete **area_id**
Explanation: Delete an OSPF area
Parameters: **area_id** 0~4294967295

Command: **route ospf area type**
Privilege: Admin
Syntax: route ospf area type **area_id type**
Explanation: Specify an address range for which a single route will be advertised.
Parameters: **area_id** 0~4294967295
type normal | stub | stub-no-summary
type normal | stub | stub-no-summary

Command: **route ospf redistribute**
Privilege: Admin
Syntax: route ospf redistribute **type**
Explanation: Redistribute routing information from a specified place to the OSPF tables
Parameters: **type** kernel | static | connected | rip | default | null

Command: **route ospf router-id**
Privilege: Admin
Syntax: route ospf router-id **id**
Explanation: Set the OSPF router id
Parameters: **id** IP address that identifies this OSPF router

Command: **route static add**
Privilege: Admin
Syntax: route static add **network gateway interface**
Explanation: Adds a static route
Parameters: **network** Destination network (nnn.nnn.nnn.nnn/prefix)
gateway Routing gateway
interface Output interface (lan1~lan8/WAN1~WAN64/WANX pvc1-16/brg_group)

Command: **route static delete**

Privilege: Admin
Syntax: route static delete **network**
Explanation: Deletes a static route
Parameters: **network** Destination network (nnn.nnn.nnn.nnn/prefix)

18.9 Show Commands

Command: **show bridge**
Privilege: Admin
Syntax: show bridge
Explanation: Shows bridge configuration
Parameters: none

Command: **show bridge brg_name config**
Privilege: Admin
Syntax: show bridge brg_name config
Explanation: Shows bridge group configuration
Parameters: none

Command: **show bridge brg_name spantree**
Privilege: Admin
Syntax: show bridge brg_name spantree
Explanation: Shows RSTP status of brg_name
Parameters: none

Command: **show bridge brg_name vlan port**
Privilege: Admin
Syntax: show bridge brg_name vlan port
Explanation: Shows each port's VLAN information
Parameters: none

Command: **show bridge brg_name vlan state**
Privilege: Admin
Syntax: show bridge brg_name vlan state
Explanation: Shows bridge state
Parameters: none

Command: **show bridge brg_name vlan table**
Privilege: Admin
Syntax: show bridge brg_name vlan table
Explanation: Shows VLAN table
Parameters: none

Command: **show dhcp relay config**
Privilege: Admin
Syntax: show dhcp relay config
Explanation: shows dhcp relay configuration including the interface/bridge mgmt on which the user WANts to run the DHCP relay and the DHCP server IP address
Parameters: none

Command: **show dhcp relay status**
Privilege: Admin
Syntax: show dhcp relay status
Explanation: Shows the DHCP relay current status, enabled or disabled. Also it displays a short description of error messages encountered when starting up the DHCP relay if it fails to enable the relay
Parameters: none

Command: **show dhcp server config all**
Privilege: Admin
Syntax: show dhcp server config all
Explanation: Shows all the DHCP server configurations including all subnets and hosts
Parameters: none

Command: **show dhcp server config host**
Privilege: Admin
Syntax: show dhcp server config host
Explanation: Shows the DHCP server specific host configuration specified by its name
Parameters: **name** host name in configuration

Command: **show dhcp server config subnet**
Privilege: Admin
Syntax: show dhcp server config subnet
Explanation: Shows specific subnet configuration specified by its name
Parameters: **name** subnet name in configuration

Command: **show dhcp server lease**
Privilege: Admin
Syntax: show dhcp server lease
Explanation: Shows the DHCP server lease information given to the clients. This is test file format describing IP address and client h/w address and start of lease time, end of lease time for each client etc.
Parameters: none

Command: **show dhcp server status**
Privilege: Admin
Syntax: show dhcp server status
Explanation: Shows the DHCP server current status, enabled or disabled. Also it displays a short description of error messages encountered while starting up the DHCP server if it fails to enable the server
Parameters: none

Command: **show interface ifname config**
Privilege: Admin
Syntax: show interface ifname config
Explanation: Shows LAN configuration
Parameters: none

Command: **show interface ifname speed**
Privilege: Admin
Syntax: show interface ifname speed
Explanation: Shows LAN speed/duplex setting
Parameters: none

Command: **show interface ifname statistics**
Privilege: Admin
Syntax: show interface ifname statistics
Explanation: Shows LAN traffic statistics
Parameters: **[interval]** Timing interval in secs to refresh display (1~60)
If the parameter is absent, the command only shows statistics once.

Command: **show interface ifname chdlc**
Privilege: Admin
Syntax: show interface ifname chdlc
Explanation: Shows Cisco HDIC parameters
Parameters: none

Command: **show interface ifname frame_relay**
Privilege: Admin
Syntax: show interface ifname frame_relay
Explanation: Shows current Frame Relay configuration
Parameters: none

Command: **show interface ifname nat**
Privilege: Admin
Syntax: show interface ifname nat
Explanation: Shows NAT/NAPT configuration
Parameters: none

Command: **show interface ifname ospf config**
Privilege: Admin
Syntax: show interface ifname route ospf config
Explanation: Show the network interface related OSPF configurations
Parameters:

Command: **show interface ifname ospf status**
Privilege: Admin
Syntax: show interface ifname route ospf status
Explanation: Show the network interface related OSPF status
Parameters:

Command: **show policy**
Privilege: Admin
Syntax: show policy
Explanation: Shows policy configuration
Parameters: **[list_name]** Show rules in the list_name

Command: **show route entry**
Privilege: Admin
Syntax: show route entry
Explanation: Shows routing entries
Parameters: **[all]** Show all routing entries including dynamic entries

Command: **show route ospf border-routers**
Privilege: Admin
Syntax: show route ospf border-routers
Explanation: Show the border and boundary router current status
Parameters:

Command: **show route ospf config**
Privilege: Admin
Syntax: show route ospf config **[area_id] [intf_name]**
Explanation: Show the OSPF configuration
Parameters:

Command: **show route ospf database**
Privilege: Admin
Syntax: show route ospf database
Explanation: Show the OSPF database summary
Parameters:

Command: **show route ospf neighbor**
Privilege: Admin
Syntax: show route ospf neighbor
Explanation: Show the OSPF neighbor list
Parameters:

Command: **show route ospf route**
Privilege: Admin
Syntax: show route ospf route
Explanation: Show the OSPF routing entries
Parameters:

Command: **show route ospf router-info**
Privilege: Admin
Syntax: show route ospf router-info
Explanation: Show the OSPF router current status
Parameters:

Command: **show system config**
Privilege: **Admin**
Syntax: **show system config**
Explanation: **Show system configuration**
Parameters: **[file] working_cfg / startup (default is working_cfg)**

Command: **show system fwinfo**
Privilege: Admin
Syntax: show system fwinfo
Explanation: Shows card firmware information
Parameters: none

Command: **show system hwinfo**
Privilege: Admin
Syntax: show system hwinfo
Explanation: Shows card hardware information
Parameters: none

Command: **show system log**
Privilege: **Admin**
Syntax: **show system log**
Explanation: **Show startup config error log**
Parameters: **none**

Command: **show timeslot**
Privilege: Admin
Syntax: show timeslot
Explanation: Shows current timeslot assignment
Parameters: none

18.10System Command

Command: **system active routing**
Privilege: Admin
Syntax: system active routing **key**
Explanation: Activates the routing feature. If users already ordered a Route-A interface card with the bridge function only, the users are able to enable the routing function by ordering an activation key from Loop Telecom then entering the key by the command. The newly entered key will enable the routing function after system reboot and hide the command.
Parameters: **key** The activation key.

Command: **system configuration reset**
Privilege: Admin
Syntax: system configuration reset
Explanation: Resets configuration to factory default values
Parameters:

Command: **system configuration save**
Privilege: Admin
Syntax: system configuration save
Explanation: Saves working configuration as startup configuration. Usually, the Router-B immediately makes configuration changes effective and stores the change in volatile RAM. The command stores the newest working configuration into nonvolatile memory to make them effective after the system reboots.
Parameters:

Command: **system firmware load**
Privilege: Admin
Syntax: system firmware load **url**
Explanation: Upgrades system firmware from a TFTP server.
Parameters: **url** URL of the firmware image. (tftp://server_ip/file_name)
server_ip: IP address of the TFTP sever
file_name: file name of the new firmware image

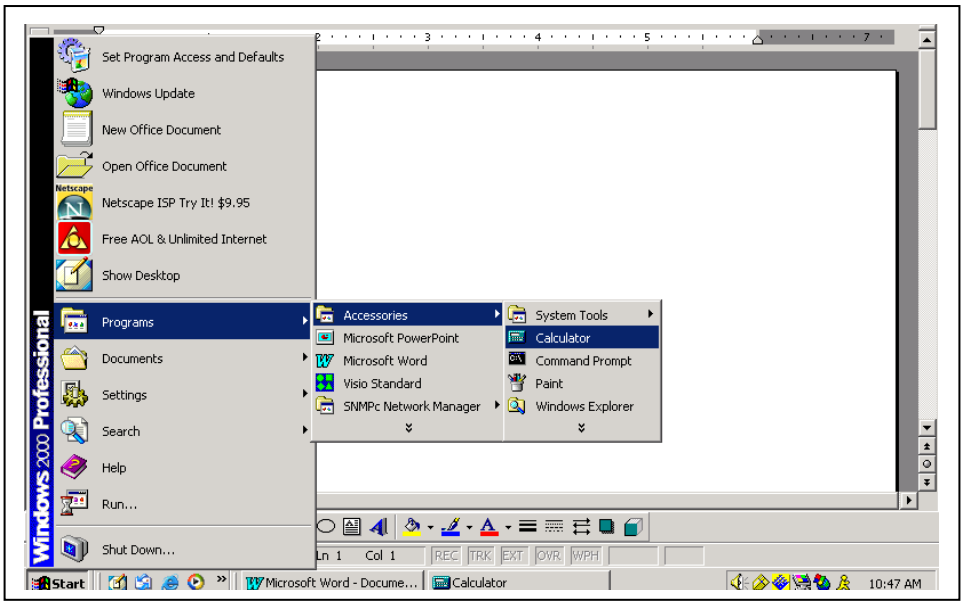
Command: **system reboot**
Privilege: Admin
Syntax: system reboot
Explanation: Reboots the system.
Parameters: none

19 Command List

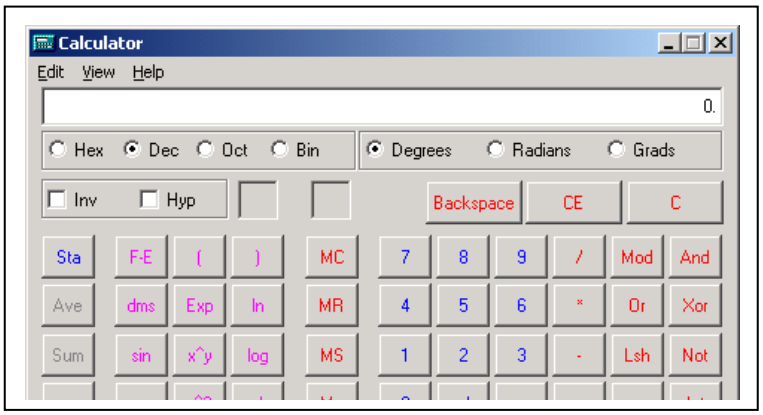
20 Appendix B: Converting a Subnet Mask to Binary Code

IP addresses are sometimes followed by their subnet mask expressed in binary (base two) code. This binary code is called a prefix length. For example, **192.168.1.1 16** is an IP address followed by the prefix length **16**. The prefix length **16** represents the subnet mask 255.255.0.0.

The simplest way to convert a legal subnet mask into a prefix length is to use the scientific calculator located on most PCs. In the sample Windows screen below, click on **Start** and then move the cursor over the **Program** and **Accessories** headings to arrive at the **Calculator** heading. Click on the **Calculator** heading.

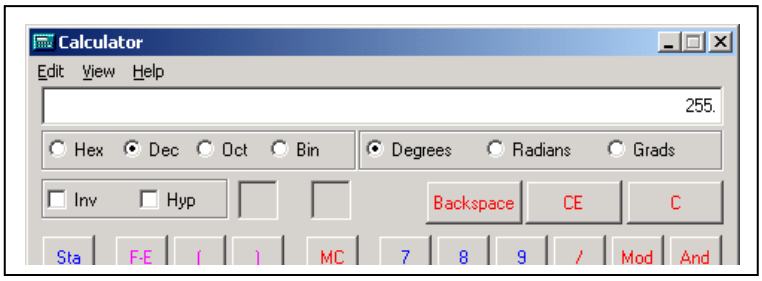


The calculator will appear. Click on the **Dec** (Decimal) heading. A dot will mark the circle beside the Dec heading as shown below (You can ignore the right hand side headings: Degrees, Radians and Grads.)

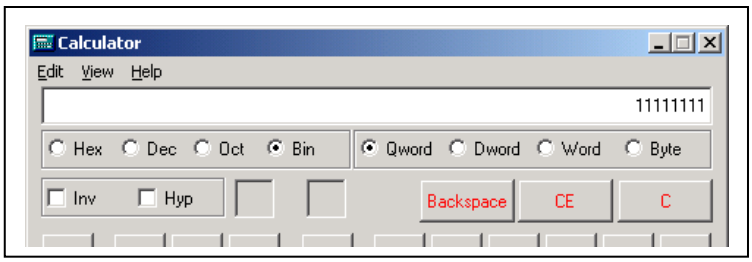


Chapter 20 Appendix B: Converting a Subnet Mask to Binary Code

The sample subnet mask that we will convert from base ten notation to base two notation is 255.255.0.0. Key in the value 255.



Click the **Bin** (Binary) heading. The base two equivalent of 255 will appear as 11111111.



Now let's look at our base ten subnet mask, 255.255.0.0. We know that 255 converts to 11111111 in base two. We also know that 0 is 0 regardless of what base it is expressed in.

base ten	2 5 5	2 5 5	0	0
base two	11111111	11111111	0	0

If you look at the base two line in the above drawing you will notice that there are sixteen 1s in it. The prefix length of the subnet mask 255.255.0.0. is thus 16. The table of subnet mask show as below.

	Subnet Mask	Prefix Length
Class A Network	255.0.0.0	8
Class B Network	255.255.0.0	16
	255.255.128.0	17
	255.255.192.0	18
	255.255.224.0	19
	255.255.240.0	20
	255.255.248.0	21
	255.255.252.0	22
	255.255.254.0	23
Class C Network	255.255.255.0	24
	255.255.255.128	25
	255.255.255.192	26
	255.255.255.224	27
	255.255.255.240	28
	255.255.255.248	29
	255.255.255.252	30
	255.255.255.254	31
Single Host Address	255.255.255.255	32

Table 19- 1 Subnet mask and prefix length conversion

21 Appendix C: Router-Activation Procedure

1. Connect a VT-100 Terminal to the Router-B card Console Port

Use a DB9 straight cable to connect the front panel Console Port of the AM3440 Router-B card to either COM Port 1 or COM Port 2 of the PC you are using as a VT-100 monitor. It doesn't matter which COM Port you connect to.

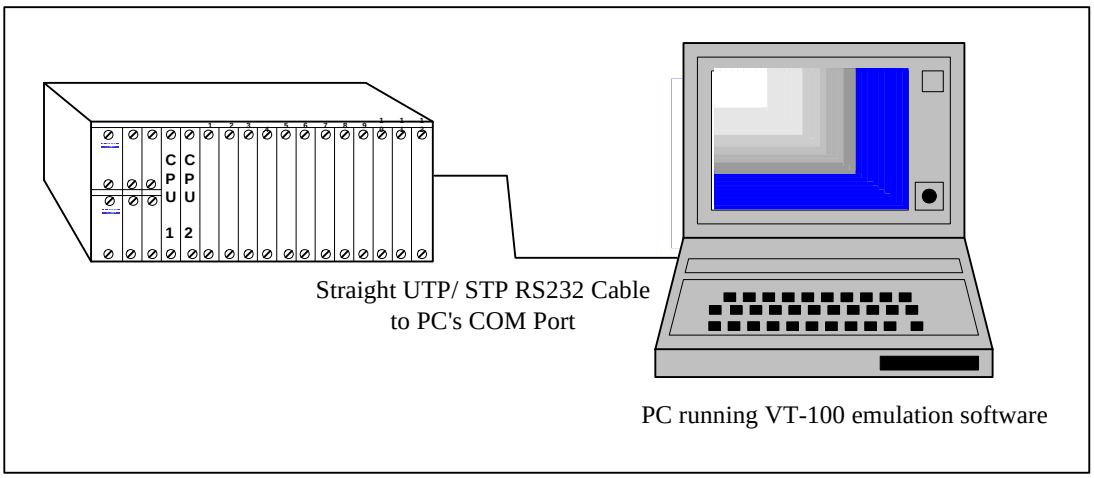


Figure 20- 1 VT-100 Terminal

Note: Many newer PCs use USB Ports. If your computer has a USB port rather than COM ports you will need to purchase a commercially available PC USB to DB9 RS232 conversion cable. These cables come with software which, when loaded into a PC, will allow you to send keyboard commands through the PC's USB Port to the DB9 Console Port of the Router-B card.

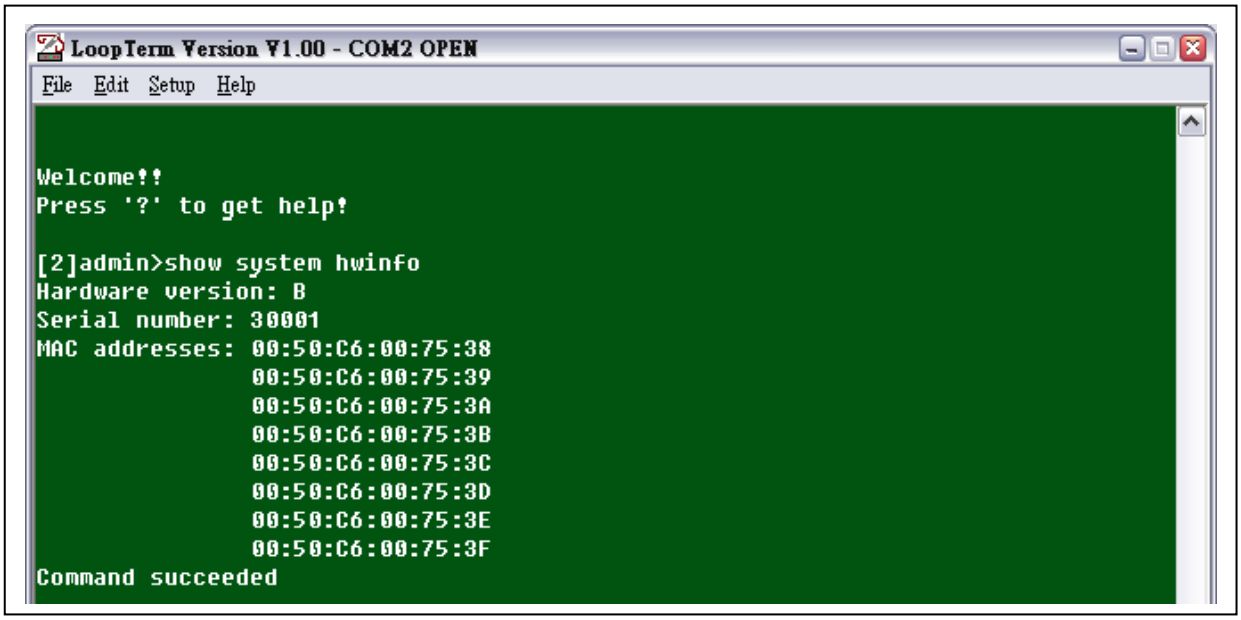
Make sure all communication parameters are correct (ie. baud rate, data bit, stop bit, and interface).

2. Power up the VT-100 and the Loop-AM3440 router.

When your VT-100 terminal and the Router-B card unit are powered up, the AM3440 screen will appear on your VT-100 monitor.

3. Find your device serial number

Key in the command **show system hwinfo**. Press Enter. Hardware information will appear on the screen. A sample screen is shown below. On our sample screen the AM3440 serial number is 27. Your serial number will be different.



Write down your serial number and then match it to the serial number/activation number list that was provided to you by Loop. Find the Router-Activation code for your unit.

Key in the command **system activate routing** followed by the Router-Activation code you found in step 3. Press Enter. If the activation code is correctly entered a prompt will say “command succeeded”.

In the sample screen below we keyed in the admin command **system activate routing 0BCE88FE092388EC7E63AC0F70C587D2** because that was the activation code provided by Loop for serial number 27.

```
[C]admin>system  activate  routing 0BCE88FE092388EC7E63AC0F70C587D2
```

4. Reboot system

In order to activate the router function you must reboot the Router-B card. You can do this by unplugging the card then plugging it into the slot or by using the **system reboot** command.
This procedure is now complete. All router-related commands should now be available.

22 Glossary

ACL	Access Control List
CIR	Committed Information Rate
CLI	Command Line Interface
DCE	Data Circuit-terminating Equip-connects
DHCP	Dynamic host Configuration Protocol
DLCI	Data Link Connection Identifier
DNS	Domain name server
DS1	Digital Signal, Level One E1 or T1
E1	European Digital signal, Level One
FR	Frame Relay
FTP	File Transfer Protocol
HDLC	High Level Data Link Control
HTTP	Hyper Text Transmission Protocol
ICMP	Internet Control Message Protocol
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
MAC	Media Access Control
NAT	Network Address Translation
NAPT	Network Address Port Translation
OSPF	Open Shortest Path First Protocol
PING	Packets Internet Groper
PVCs	Private Vitual Circuit
RAM	Random Access Memory
RIP	Router Information Protocol
RSTP	Rapid Spanning Tree Protocol
STP	Spanning Tree Protocol
TDM	Time Division Multiplexing
TFTP	Trivial FTP
URL	Universual Record Locater
VID	VLAN ID
VLAN	Virtual LAN
WAN	Wide Area Network
WINS	Windows Internet Naming Service